JANUARY 1948 25 CENTS

POPULAR MECHANICS MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND

SEE PAGE 88

Dependable

CHAMPION

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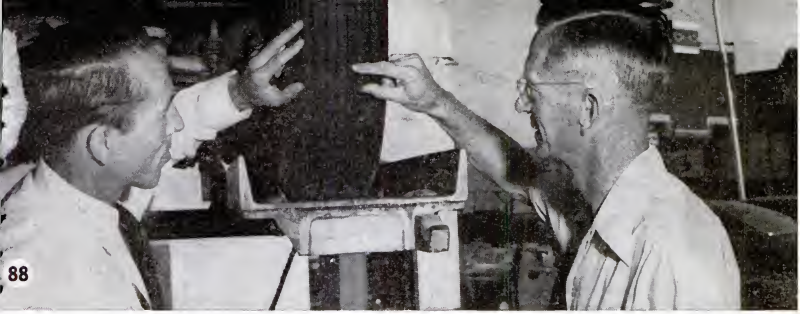

Typical examples: the B. F. Goodrich tire that outwears prewar tires

B. F. GOODRICH tires outwear prewar tires. This is backed by the personal experience of B. F. Goodrich owners. Here are three recent reports:

Typical example No. 82: "Outlasted any prewar tires." Pictured at left is Henry D. Anderson of Seattle, Washington, with B. F. Goodrich dealer Hugo Andiesen, Jr. Henry D. Anderson writes:

"I appreciate good tire mileage. It is one of the essential things when it comes to keeping costs down on my car. This B. F. Goodrich Silvertown tire which I am finally replacing had gone 43,275 miles (at the time of the picture). These were hard miles, ranging from driving on desert roads to the heavy pounding of mountain truck trails. And since this car is used for fire and police work, much of this mileage was put on at high speeds and in all kinds of weather."

Typical example No. 91: "Never experienced better service from any tire." Shown here is H. F. Smith of Rt. No. 1, Unicoi, Tenn., who says:

"Half of my driving is over rock roads, the other half is on hard surface that has quite a lot of chuck holes in it. These B. F. Goodrich tires have not been petted, but have been subjected to 30,593 miles of rather rough treatment. In all my experience I have never received better service from any tire."

Typical example No. 88: "49,723 miles and still good!" P. U. Alexander of Goose Creek, Texas, shown in the photo at the top, states:

"I purchased two new B. F. Goodrich Silvertown tires in 1945. These tires had gone 49,723 miles when the picture was taken, and I believe they are good for another 10,000 miles."

This is a good time to buy tires. Your B. F. Goodrich dealer will give you a liberal allowance for your old tires if they are still good enough to be used or recapped. *The B. F. Goodrich Company, Akron, Ohio.*

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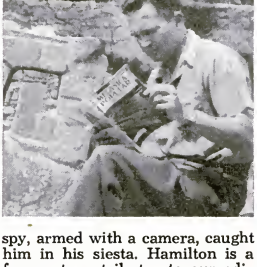
YOUR HOME is an endless procession of problems. A faucet leaks. The window sash is stuck fast. An old crack in the ceiling is causing trouble again. There's always something! So to your rescue we come with the Clinic for Homemakers, a question-and-answer column starting this month on page 204. Whenever a home repair problem confronts you, write the Clinic Editor for help; whether or not your question is answered in the monthly column, you will be answered by mail with expert advice.

ROY SHIPSTAD, famous skater, tells how to "Cut a Figure on Ice" in the February issue.

HOW-to-build-it features in the Craftsman section next month include a folding table-and-chair set for young tea-party hostesses and chests for coin collectors.

WHILE "Digging Into Mexico's Past" for the article appearing on page 130, Andy Hamilton propped himself against an ancient ruin to dig into Mecanica Popular, our Spanish language edition. Our



spy, armed with a camera, caught him in his siesta. Hamilton is a frequent contributor to our editorial pages, was a lieutenant commander on Admiral Nimitz' public relations staff, is now Director of Public Information at UCLA.

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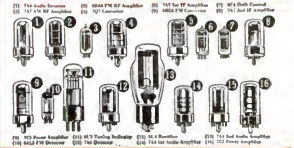

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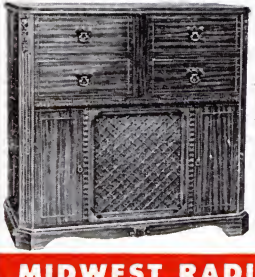

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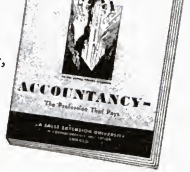

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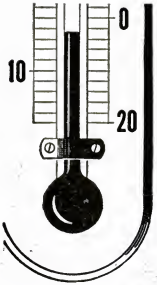

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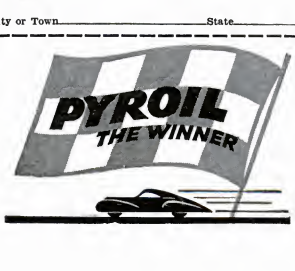

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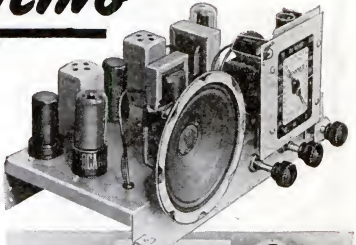

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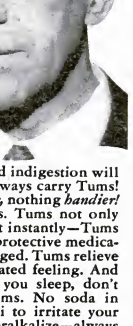

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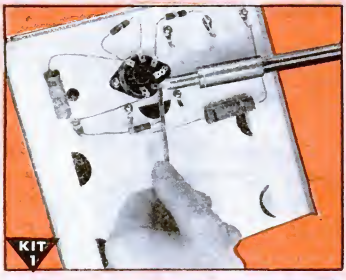

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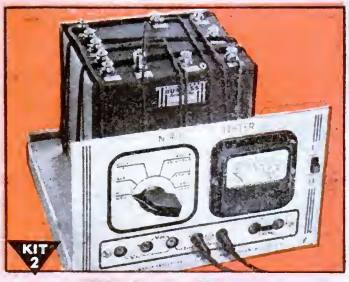

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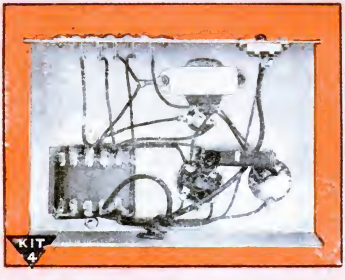

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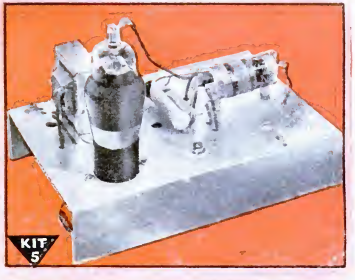

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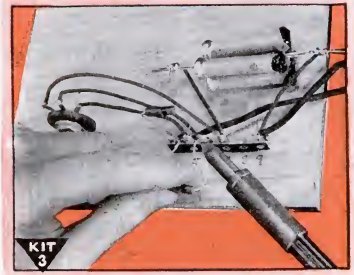

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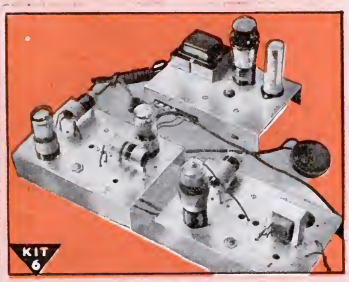

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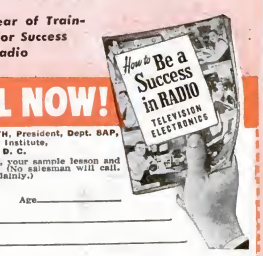

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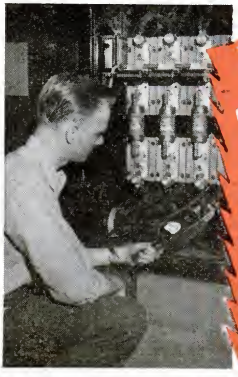

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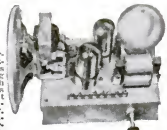

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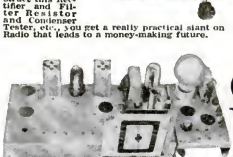

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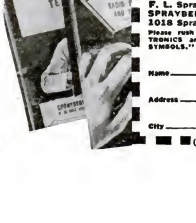

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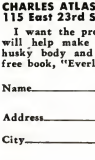

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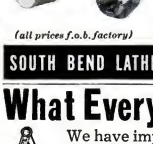

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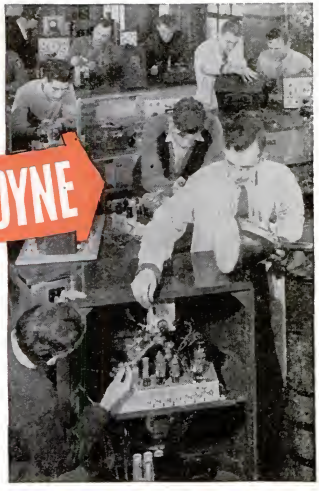

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By S. T. CHRISTENSEN
the "Fix-it Man"

"WELL, I guess I'm the fellow to see, for I've repaired thousands of refrigerators (home and commercial both), vacuum cleaners, radios, washing machines, irons, fans, lamps, mangles, motors, etc. In fact, many of my customers call me their "electrical appliance doctor." And, "doctoring," I might add, has paid me a good substantial income for quite a few years. Funny, in a way, how I got started. Always liked to tinker and by experimenting around I found that most electrical appliances had many things in common. That, regardless of what the appliance was used for, or who the manufacturer was, the basic principles were much the same. From fixing my own appliances to fixing friends' and then for strangers at a fee, seems now to have been but a small step.

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At first, I let the owner decide the charge and, frankly, I was amazed at what I earned per hour. But then, when one figures what initial costs are involved in buying most electrical appliances, one can readily see that spending extra dollars for repairs is well worth while. Before long I was making more in my spare time repairing than from my regular job. The result . . . I went into business for myself. When war came, business boomed, for new appliances were not available.

For a while, repair parts (needed on some jobs) were a little difficult to get. But that situation quickly adjusted itself and many repair parts were given the high priority rating of AA2. After all, we had to provide for the health and well-being of our civilian population.

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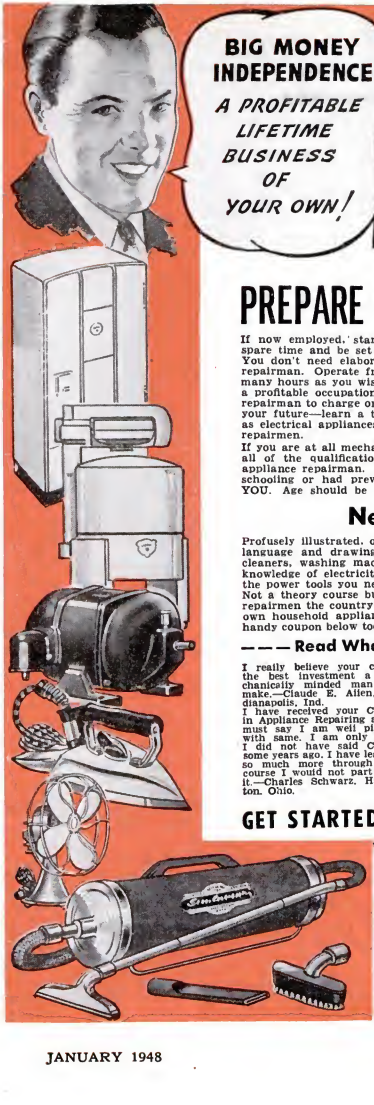

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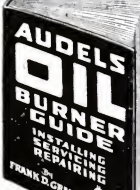

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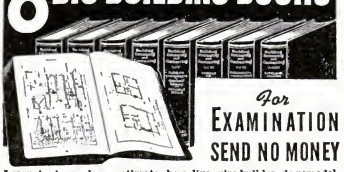

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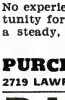

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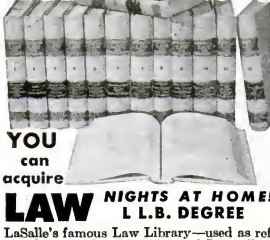

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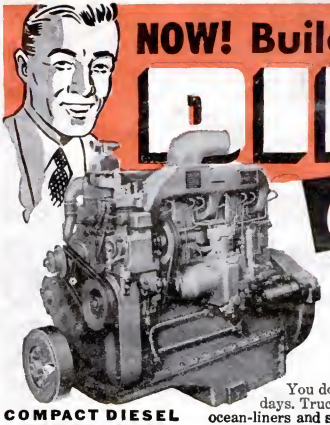

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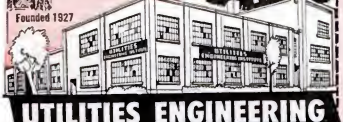

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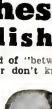

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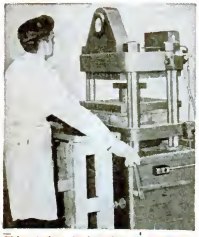

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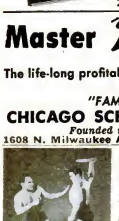

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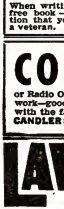

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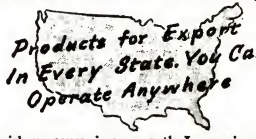

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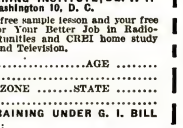

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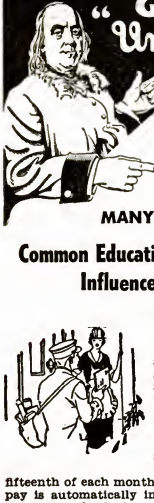

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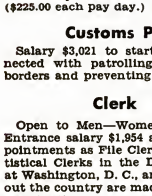

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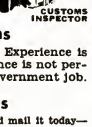

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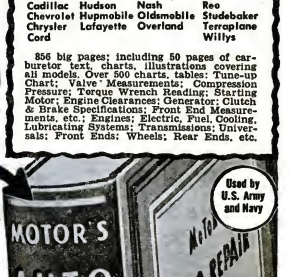

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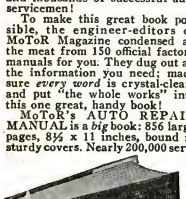

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F. W. Johnson, Manager, Classified Advertising
Popular Mechanics Magazine, 200 East Ontario Street, Chicago 11, Illinois

1236 CLASSIFIED ADVERTISEMENTS 1236 OPPORTUNITIES FOR YOU

AUTOMOBILES, MIDGET CARS

FROM Speedway to roadway! Track-proved hi-speed heads and manifolds now available for passenger cars! No special tools needed! Increase horsepower 25%! Astounding getaway! Free illustrated catalog. Speedsport, 5747-D Waveland, Chicago 34.

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AUTOMOTIVE Trouble shooting. 500 questions and answers. $1.00 postpaid. Charles Nelson, 2908 Washington Avenue, Santa Monica, California.

HOT-ROD Manual, fast Fords, photos, instructions, $1.50. Airmailed $1.75. Racing parts list 25c. Hollywood Hot-Rod, Los Feliz, Box 9628P, Hollywood 27, California.

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MIDGET Car Book—Includes plans for easily building midget autos, speedy midget racers, two passenger highway runabouts, sporty 3-wheel "Motor-Rite," inexpensive scooter car. Simplified construction instructions, photographs, drawings, supply lists. $1.98. Almquist Engineering, Box 660-F, Brooklyn 1.

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HEATERS — Easier starting, quicker warm-up, less oil dilution. Clip over intake manifold to preheat carburetor and intake system. Operates off battery. $2.00 each postpaid. Michehl Industries, Atlantic Bldg., Washington, D. C.

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AUTOMOBILE Racing, Sixth Edition. 100 illustrations. Working drawings with building instructions for Ford-60 midget, California roadster, Offenhauser racer. Details on racer parts. Sample entrance blank. World's record 158.5 m.p.h. rear engine four-wheel drive car. Interesting information for fans, drivers, mechanics. $2.00 postpaid; $2.25 c.o.d., Ray Kuns, Department 63, Cincinnati 27, Ohio.

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USED-CAR Buyer's Handbook. Save dollars, grief. Photographs, dealers' tricks, complete tests. $1 pp. Post Publications, Box 723-VE, Arcadia, California.

INSTALL V-8 engine in your Model A for extreme acceleration, more top speed, smoother performance. Complete details, photographs, $1 postpaid. A-V-8, Box L-1, Eaglerock, Los Angeles 41, Calif.

PROFESSIONAL Midget racer, motor-scooter, midget roadster, and midget motorcycle. Plans, specifications for all four contained in illustrated handbook, 25c. Big list bargain priced used motors, motorscooters, servicycles, etc., included free! Midwest, 3839 Drummond, Toledo, Ohio.

MAKE Your Model "A" do 100 m.p.h. Lightning acceleration, breath-taking top speed. Complete details, photographs, $1 postpaid. Four Barrel, Box L-1, Eaglerock, Los Angeles 41, Calif.

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AUTO SUPPLIES AND EQUIPMENT

ENGINE Ping? Ignition skip? Before you buy a new distributor ask your garage for a Spark-O-Liner or write Hove Spark-O-Liner, Minneapolis 4, Minn.

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AUTO Parts. New or rebuilt. Prompt shipment. Write requirements. Save money, buy direct. Factory Warehouse, Mechanics Auto Parts, 3807-PM North Ashland Ave., Chicago 13.

CAR Trouble? Specialists in transmissions, motors, mufflers, all operating parts. New, used, rebuilt. Lowest prices. Describe needs. Atlas, 2226F State, Chicago 16.

WELDING Bodies, repairing fenders, pays good profits using Hobart's a.c. arc welder. Catalog free. Write Hobart Welders. Box M-182, Troy, Ohio.

WELDERS For all requirements. Free catalog. Write Hobartweld. Box M-183, Troy, Ohio.

SPRAY Paint your automobile. Complete professional instructions, $1.00. 155 Tasso, Palo Alto, California.

SPEED And Power Handbook—Construct own superchargers, water injectors, compression heads, fuel saving devices! Get. racing speed, acceleration, dynamic power increases from any car. Mileage tips! Speed secrets. Ignition tuning! Hot-rods! Carburetion tricks. Fuels! Including "Restyling Ideas" — streamlining, model revising! Customizing. Sport changes! Accessories! $1.98. Newhouse Industries, 5941-B Hereford, Los Angeles 22.

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FILTERMASTER'S Flo-meter tells when to change oil filters and crankcase oil. This instrument eliminates guessing from engine lubrication. Increases useful engine life, pays for itself quickly. $2.80 at automotive stores or $2.00 postpaid with return this ad. Get yours now. Fully guaranteed. Information on request. Filtermaster, Dept. PM-5, 440 E. Schantz, Dayton 9, Ohio.

AUTO Parts for all cars, transmissions, motors, differentials, fenders, carburetors. Security Auto Parts, 1923-PM Grace, Chicago 13.

NEW Plymouth owners—Light plastic hood ornament. Equipment, instructions, $1.00. Deloplaine, 441 King, Pottstown, Penna.

EASY Starting at 30 below with Hove Spark Plug extensions. Keep plugs dry. Six cylinder set $2.00, 8 cylinder $2.50 prepaid. Specify make and model car. Hove Engineering Company, Minneapolis 4, Minnesota.

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BURN Water in your car. Costs less than gas. More power. Cleaner motor. Mail card for data on $17.50 Octa-Gane Water Injecting Carburetor. Advanced Automotive Products, 563-2 Lake Road, Webster, N. Y.

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GUARANTEED Winter starting ignition on two volts. Eliminate burned points. Unit $16. Plans for making your own $1.00. Give car make, model. Ignition Engineering Co., 3344-A Beard No., Minneapolis, Minn.

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NEW And used automobile and truck parts. Lowest prices. Complete stock. Prompt reply. Babbitt Auto Parts, 2833 W. Chicago Ave., Chicago 22.

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STREAMLINER Trailer, 17 ft. plans manual $1.00. Circulars. Illustrated trailers to 27 ft. 20c. Craftsman Books, Box 1153, Milwaukee 1, Wis.

SAVE 50%—Build your trailer; 1948 Plan booklet, all types, house, camp, sport, and utility. Plus complete trailer parts catalog and booklet "Trailer Building." Send $1.00. Marine Mart, Buffalo 7m, New York.

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BUILD Your own trailer! Save money! Have every feature you want! Plans for house, sport, camp and utility trailers. Catalog describing 9 models 10c. 15c in Canada and overseas. Jim Dandy, Box 125-A, Wausau, Wisconsin.

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EXPERT Rebuilding of racing and stock motorcycle engines. Largest stock of parts and accessories in middle west. Write for details. Bernardi Cycle Co., 1214 Jackson Blvd., Chicago 7, Illinois.

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MOTORCYCLE News, monthly. Yearly subscription $1.00. Latest worldwide information. Motorcycle News, 5424-A Sawyer, Chicago 25.

BARGAINS Galore. Parts for that hot rod. Bargains in motorbikes and scooters. Send 25c. Behnke's, 5721 Leland, Chicago 30, Ill.

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AUTO-PED Motorscooter $10; midget racer less motor $14; midget track racer, new motor $65; Indian '45 motorcycle $45; Indian Chief $40; Harley single engine $4; Whizzers $30 up; 4500 small tires $1 up. Mailorder only. Plenty brand new and surplus gasoline engines, motorscooters, midget cars. Send 25c for Big War-Bargain catalogue number 23, just out, listing the above and over 400 other bargains in motors, motorscooters, midget racers, parts, plans, etc. (35c by first class mail). Midget Motors Directory, Athens, Ohio.

WHIZZER Wanted. Drastic bargain only. List of all offers 10c. Thomas Fuscaldo, 429 Preakness Ave., Paterson, New Jersey.

HARLEY-DAVIDSON Supplies, parts, accessories, oil service, tires all sizes, repaired 45" motors. Send $2.25 for Army Motorcycle Manual, 10c for bulletin. Knuth's (Harley-Davidson Dealers), 2491 Fonddulac, Milwaukee, Wis.

CHROME Plating on all motorcycle parts. Doll up your bike. Free literature. Master Silverplaters, 2031 Caniff Ave., Detroit, Michigan.

BICYCLE Supplies, wholesale, retail.List, 10c. Universal, 4713 Virginia, St. Louis, Mo.

SCHWINN Bicycles for Christmas. Send dime for list. Wholesale. Retail. Century Cycle, 3447 Lawrence, Chicago 25, Illinois.

HARLEY-DAVIDSON Parts, accessories, batteries, and tires, 24 hour service. Authorized factory dealer. Philadelphia Harley-Davidson Company, 857 North Broad Street, Philadelphia 23, Penna.

CUSHMAN Motorscooter $15, Shaw bicycle motor $15, Harley-Davidson motorcycle, $35! Send 25c for bargain catalog #8 packed with money saving buys in motorscooters, motorbikes, midget cars, motors, wheels, tires and parts. Gall and Company, 538 Erie, Toledo, Ohio.

WHEELS! Build wagons, scooters, mowers, trailers, wheelbarrows, grocery carts, baby carts, play pens, baby carriages. 4" to 16". Free list. Trulsen Mfg. Co., 811 E. 31, Kansas City, Mo.

TIRES And industrial wheels, suitable for scooters, wheelbarrows, farm equipment, etc. All sizes. Bicycles and accessories. Largest assortment in America. Send dime for list. Cycle Transport Company, 1241 So. Michigan Ave., Chicago 5, Illinois.

BUILD America's lowest priced motorscooter speedster! Complete plans, specifications, $1.00. Big list bargain priced used motors, etc., included free! Motor Supply, Box 1682-CS, Toledo, Ohio.

LARGE Stock Indian parts. Expert motor rebuilding. New and rebuilt Chief motorcycle, motors only. Indian Motorcycle Sales, Kansas City 1, Mo.

CUSHMAN Motorscooter $20 (includes motor and extra tires), Midget racer $15! Send 25c for big catalog #938 listing these and scores of other sensational bargains in motors, wheels, motorscooters, motorbikes, servicycles, tires, etc. Associated, Box CS-1764, Toledo, Ohio.

AVIATION

FLYING Quiz for aviation enthusiasts. Big 96-page book, printed in large legible type, chock full of pilot information. Over 1,000 questions and answers that a pilot needs to know. $1 cash postpaid, money back guarantee, no c.o.d. Hangar Flying, Dept. 4H1, 112 E. Grove, Bloomington, Ill. Clip this.

VETERANS: Flight training under the G. I. Bill. Tuition paid. Private, commercial, flight instruction, instrument and multi-engine ratings. Opportunities to work for living expenses or tuition, if not a veteran. Write Gottschalk School of Aeronautics, Adrian, Mich.

AIRFORCE Sextants, marine or air navigation, Fairchilds $12.50; Bausch-Lomb $29.75. Aerial cameras $175; Elgin stop watches $12.75. (Free bulletin.) Pan American Navigation Service, 12021-C Ventura Blvd., N. Hollywood, Calif.

JET Propulsion experiments. New design. Drive bicycle. Circular on plans. Rush name. Maupin, Tipp City 5, Ohio.

PROPELLERS—2 & 3 Blade, designed for ice-snow sleds, boats. Literature. Standard Aerocraft, Box 387, Ft. Worth, Texas.

JET Propulsion gas turbine model engine. Build a real turbo-jet model engine with single-stage centrifugal compressor and turbine. Send $2.00 for complete plans for construction, design formulas and curves for checking performance and testing to Rotojet, Dept. 3, Box 757, Los Angeles 25, California.

SUPERCHARGERS — Aircraft, turbine driven, government cost $3,000. Convert to turbines, blowers, jets, etc. $15.00 each f.o.b. Washington, D. C. Michehl Industries, Atlantic Bldg., Washington, D. C.

GET Into aviation! Train now at this Lincoln Aviation Institute for responsible position with an airline, aircraft factory or private airport operator. Good jobs open! Big money paid! We assist graduates in locating positions. Write today for information to Registrar, Lincoln Aviation Institute, Union Air Terminal, Lincoln, Nebraska.

GIANT Glider kites. Double. 14x10 ft. Lifts 100 lbs., tows car, etc. Cost government $108. Yours for $20. Satisfaction guaranteed. Great Northern Mart, North Adams, Mass.

NEW Airplane tires, tubes and wheels, complete with bearings and spindle. For installation on harvesters, farm implements, low bed tractor trailers, etc. A size for every load. The world's largest stock. Send post card for details. Dept. B, Post Office Box 89, Merced, California.

B-29 COMPUTERS, 400 Cycle dynamotors, 60VDC amplidynes and servo amplifiers, turret drives, bomb releases, starter solenoids, collector rings, etc. List. Ereco, 2912 Hewitt, Everett 1, Washington.

SKI-TOWS, Portable, auto-powered, 500 ft. long. Pulls you both ways. Up, level or downhill. Set up in 20 minutes. Only $125. Send card for particulars. Great-Northern Mart, North Adams, Mass.

BATTERIES, GENERATORS

$150.00 NEW Generators, only $33.00. See Greer advertisement under "Welding."

GENUINE Edison storage battery. Light, power, non-acid, odorless. Fifteen year life. Has none of the acid type diseases. Five year unconditional guarantee. Illustrated literature. See-Jay Co., 321 Yonkers Ave., Yonkers, New York.

ELECTRICAL SUPPLIES, EQUIPMENT

FREE Catalog—Motors, welders, welding supplies, generators, fencers, electric mowers, freezers, other electrical items. LeJay Company, Minneapolis, Minn.

$150.00 NEW Generators, only $33.00. See Greer advertisement under "Welding."

ALNICO Magnets, free list. Terry Sales Company, 3726 South Detroit Avenue, Toledo 9, Ohio.

LIGHT Plants—Kohler and Delco; new and used. Write for free bargain list. Moutoux, 511 Locust Street, Evansville, Indiana.

ELECTRIFY Any make sewing machine $16.95. Complete outfit, motor, control, bracket, pulley, belt, ready to plug in. Instructions makes easy installation. Associated Maintenance Company, 210 East 34th Street, New York City.

LAMP Parts—New 1948 illustrated catalog just out. Send 10c Every part necessary to build, convert or repair lamps. Gyro Lamps, 5416P Clark, Chicago 40.

LAMP Sockets, mogul sockets, three way switches, tumbler switches, receptacles, cordsets, electrical repair parts, lamp parts, wires, etc. Catalog 10c. Gearon Company, 6405 North Oakley, Chicago.

MOTORS ¼ H.P., 115 v., 60 cy., 1750 r.p.m. Heavy duty. $21.00 plus postage. Small G.E. fan motors 115 v., 60 cy., 1600 r.p.m. $6.75. Magnet wire. John Weeks, 527 Werden, Grand Rapids 7, Mich.

VACUUM Cleaner heavy dustproof cloth dustbags, $2.00 postpaid. State model. Vacuum Service, 1671 3rd Ave., New York City.

ELECTRIC Pencil: Engraves all metals. $1.00 postpaid. Beyer Mfg., 229-H Dixon, Uniontown, Penna.

BUILD Your own lamps. Save half. Free photos. Buddy Products, Dept. 30, 1123 Belmont, Chicago, Ill.

ELECTRIC Pencil—Writes, engraves all metals. 110 volts. Complete $2.95 postpaid. Reb Industries, Dept. 265-DA, Elmhurst, Illinois.

FIX Your own electrical appliances. Amazing instruction booklet with complete diagrams shows you step by step how to repair flat irons, fans, vacuum cleaners, clocks, washing machines, lamps, etc. A little course in itself. Worth dollars. Costs you only 25c. Ask for #111. Popular Mechanics Press, 200 E. Ontario Street, Chicago 11, Illinois.

FLUORESCENT Fixtures. Assembled, parts, supplies. State requirements. Naturalite, 1520 Ardmore, Chicago 28.

NEW Surplus wire and cable. 200 sizes and types. Armored, Tirex, lead. Free list. Ereco, 2912 Hewitt, Everett 1, Washington.

VOLTAGE Regulators. Autolite, silver contacts and large radio filter. Like new condition. Original cost $140.90. Price $5.95 prepaid. Also new Delco Remy regulators. Platinum contacts. $8.95 prepaid. Both 24 volt, 50 amp. State Ignition, 2521 Indiana, Chicago 18, Ill.

WELDING, SOLDERING, PLATING

NEW Aircraft lighting generators. War surplus. Only $49.50. Original cost $250.-00. Can be used for lighting or converted for use as welder, electric plater, fast battery charger, auxiliary power unit, etc. Model R. 2, manufactured by Jack & Heintz, 30 volts, 300 amp. d.c., shipping weight 68 lbs. Size 18"x7". Also new G. E. and Westinghouse P.1 generators, d.c. 200 amp., 28½ volts, cost $150.00, price $33.00 each. Immediate shipment. Check with order. Greer, Dept. PMC, 460 South State Street, Chicago, Illinois.

A.C. Welders, 110 v. welds ½" steel. $29. Morris Welding Service, 1850A State St., Schenectady 4, N. Y.

PORTABLE Arc welder, "build your own." Your engine plus Hobart welding generator saves $350. Starts paying business. Free instruction book. Write Hobart Welders, Box M-184, Troy, Ohio.

WELDERS For all requirements. Free catalog. Write Hobartweld, Box M-185, Troy, Ohio.

OXY-ACETYLENE Welders—Cut perfect circles with "Whiteway" attachment. Complete $3.00; plans 50c. White's Machine Shop, Cashion, Okla.

SAVE 50% On a.c. welders. 110-220 volts. Holgerson's Service, Canton, Kans.

WELDERS, New and popular makes, drastically reduced prices $14.95 and up. Guaranteed. Send for sales bulletin for buying and save. M. J. Lalick & Associates, 6859 So. Anthony Ave., Chicago 37, Illinois.

WELDER—New portable Champion special transformer welder; 110/220 volts, a.c. 8 heat stages. Welds, brazes, solders, cuts all metals. Complete with electrode holder, helmet, rods, carbons, fluxes, cables. Also special flame weld torch. Easy to use. Full directions. Splendid for shop, farm and home repairs. Guaranteed. Only $27.50. Money back guarantee. Also resistor model, now $14.95. Magic Welder Co., 239 MP Canal St., New York, N. Y.

OXY-ACETYLENE Welding outfit including: Full oxygen and acetylene cylinders, $72.95 complete, f.o.b. Cleveland, Ohio. New, supply limited. Check or deposit with order, balance c.o.d. Cylinders can be refilled anywhere. Ideal for hobbyists, garages, repair shops, etc., includes supply of rod. The Burdett Oxy-Weld Equipt. Co., 3399 Lakeside Avenue, Cleveland 14, Ohio.

OXY-ACETYLENE Welding and cutting outfit complete with cylinders and carrying case. Designed especially for hobbyshops, small repair shops, refrigeration and electrical service men. You own the cylinders. Free literature. A-A Welding Supply Co., C9228 S. Ada St., Chicago 20, Ill.

30 AMP. Selenium plating rectifiers with Powerstat control, $85.00. Lead lined tanks, geared motors for agitation. Complete line of bronzed baby shoe mounts. Hollywood Bronze Supply, 1770 N. Vermont, Hollywood 27, Calif.

BUY Direct from factory. Welding outfit $48.36; soldering outfits $12.70 to $9.70 complete prepaid. Box 331, Hamilton, Ohio.

MACHINERY, TOOLS AND SUPPLIES

CASTINGS, Blueprints, materials for woodworking and metalworking machine tools. Suitable for commercial or home shop production. 23 items, catalog 10c. Lewis Machine Tool Co., 3217 Union Pacific Avenue, Dept. M, Los Angeles 23, California.

SHEBEL Saw filer. Files all saws. Circular. A. P. Shebel, 730 B. So. 2nd St., Milwaukee 4, Wis.

9" LOGAN Lathe—Brand new, $159.50. 18" between centers. Immediate delivery. Send for circular. Travers Tool Co., Dept. S 5 Court Square, Long Island City, N.Y.

ANYONE Can sharpen saws using the Teeho-Tool! New 25c model. Write, Teeho, 316 North Maywood, Illinois.

INTERNAL Pipe wrenches for close fits and removing broken pipe. Set of three, ½", ¾", 1" only $10.50 postpaid. Check with order. Porst Sales, 132 West Union Street, Pasadena, California.

JEWELER'S Lathes, engraving blocks, chucks, tools. Miles Co., Bedford, Virginia.

HOME Lathe owners—Build your own attachments. Send for photograph, sample of work and list of blueprints. Cut gears, ratchets, etc. Make neat screws easy way. The Home Shop, 415 Raymond Ave., Glendale 1, Calif.

MACHINE Shops, garages, machinists, home craftsmen, hobbyists. Get our prices on tools, supplies. Catalogue 10c. Refunded. Precision Tool Service, Dept. M, 55 E. Washington, Chicago 2, Illinois.

ELECTRIC Sanders low as $7.85. Circulars. Kalder Engineering, Grand Rapids 8, Michigan.

FOR Sale—Keyway machine, use in electric drills, real machine tool, cuts ⅛ to ¾ inch keyway. Seventy five dollars postpaid. Distributors wanted. Holt Equipment, Independence, Oregon.

HARDWARE, Tools, drills, belts, pulleys, pattern, model supplies, electrical equipment, steel, brass, drill rod. Catalog 5c. Terek, 6304 Patterson, Chicago 34.

BENCH Saws $17.50, band saws $25.00. Bargain lists 3c. Sunshine, Berkshire Heights, Penna.

MACHINE Shop tools released for private industry; Gridley Auto Screw Machine $300. 14"x6' Engine lathe $180. 16"x 6', $180. 18"x8' quick change Engine lathe $580. #3 Brown & Sharpe miller $730. Snyder 25" drill $140. 5 h.p. single phase motor $100. 36" band saw $225. Van Norman "Relio" grinder $140. Money back guarantee. Conversion Parts Co., 278 Adams St., Boston 22, Mass.

ARC Welders. A.C. or D.C. 150-800 ampere. Portable, stationary. Prompt delivery. Reasonable terms. Also electrodes and accessories. Free catalogs. Write Hobart Welders, Box M-188, Troy, Ohio.

DRILLS—Taps reconditioned, up to seventy-five percent off list. Send for free circular just published. Perry Screw and Bolt Corporation, 4250 Grand-River, Detroit 8, Michigan.

FOOT Switch—Operates all power tools. $3.95 postpaid. Reb Industries, Dept. 285-DB, Elmhurst, Illinois.

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OIL Coloring photographs wonderful hobby. Free details. Home study course. Goynes, Lock Drawer 1784-G, Orange, Texas.

PHOTOGRAPHERS, Build a portable repeating flash strobolite. Simple plans, pictures, parts list $1.00. Sidmur Electronics, Box 96, Dept. P, Midwood Station, Brooklyn 30, New York.

CAMERAS, Enlargers, projectors. Lowest prices. Free catalog. Cavalier Camera, 1822 Center, Pittsburgh 19, Penna.

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BASS Says! At the sign of the old "Horse Trader," 37th year. Thousands of satisfied customers everywhere! Finest brands including Kodak, Bell & Howell, Argus, Zeiss, Leitz, etc. Satisfaction always guaranteed, or your money back! Bass buys 'em, sells 'em, trades 'em. Write or wire. Bass Camera Company, Dept. AG, 179 W. Madison St., Chicago 2.

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8 PRINTS All enlarged to nearly postcard size from your roll or negatives 25c; 16-50c. (Trial offer). Willard Studios, Box 3535A, Cleveland, Ohio.

POSTCARD Size enlargements 5c. 5x7, 2 for 25c. Kobylak, 50 Downs, Binghamton, N. Y.

ENLARGEMENTS—5x7, 15c; 8x10, 25c; glossy or dull. Gorgeously oil colored 50c extra. Negatives made from pictures 50c up. Special photo services, send for list. L&R, P.O. Box 1476, Milwaukee, Wis.

THREE 8x10" Enlargements, $1.00. Send negatives. Phototron, Dept. M, Andover, Mass.

SENSATIONAL Introductory offer! Send snapshot or negative, this ad and 10c. We'll send you a beautiful 7x5" enlargement! Or, Kodak roll developed and printed (with free coupon) only 25c; or 8 giant prints from roll, 30c. Reprints from negatives, any quantity, regular size, 3c; Giant size 4c. Candid rolls—36 exp. 35mm, developed, vaporated, enlarged to 3x4, $1.00, 18 exp. 50c. Free mailers. Free premium offers sent on request. American Studios, Dept. 364, La Crosse, Wisconsin.

HURRY—Limited trial offer 16 prints 20c. Aircastles Studios, 7050 Van Buren, Hammond, Indiana.

FINEST Quality. Fastest service guaranteed. Roll developed and 16 Velox prints, 25c. Reprints 2c. 100 $1.50. Dick's Photos, Louisville, Ky.

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FREE Government surplus film, 116-120-620 only. Send 3c stamp for postage. Free Films, Des Plaines, Illinois.

TRUE Color prints. Fast service. 8x10 $4.00; 5x7 $2.50; 35mm. 2¼x3¼ 60c; 3¼x4¼ $1.00; Ex. G. I. Color Film $1.00 per roll. J. C. Benison, 5850 Hazeltine Ave., Van Nuys, Calif.

"BETTER Photo finishing." Jumbo prints 40c a roll, Reprints 3c. Best by test. Fast service. Sealtone Photo, Box 468, Seal Beach, Calif.

16 DECKLEDGE Prints from any standard 8 exposure roll 25c. Quick service. Professional work. Skrudland, Lake Geneva, Wis.

FREE Price list on quality developing, printing, enlarging. Write for it today. Bryan's Photo Shop, Dept. M, Panama City, Florida.

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RARE 8-16MM. Silent-sound films. International, 2120 Strauss, Brooklyn, N.Y.

SEND 10c for catalogue of movie cameras, movie projectors, films, etc. Sterling's, 679 Northampton, Easton, Pennsylvania.

WESTON 50! Guaranteed film. Free processing! 25' (8-8) $1.45. 100' 16mm. $3.45. M K Photo, 451 Continental, Detroit 14, Michigan.

EXTRAORDINARY 8mm.-16mm. Film, equipment bargain catalog, 5c. Towers, 935 North 40th, Philadelphia 4.

"MISS America, 1947," "Atomic Fury," (Bikini tests), 53 other 8mm.-16mm. Kodachrome home movies. Catalog, 25c. Projection length sample, "Miss America," $1.00. World In Color Productions, Elmira, N. Y.

500 WATT 8mm. projector $49.50. Others available. Selco, Danvers, Massachusetts.

I BUY, Exchange, swap movie films. Rental catalogue 25c. Harvey Iris, Box 539, Brockton, Mass.

35MM. Sound features, westerns. C. Rogers, Box 26, East Atlanta, Ga.

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FREE Movie catalog. Superior Film Service, Box 713, Dept. 3, Troy, N. Y.

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35MM. Sound-silent films, projectors. Bought, sold. Edward Elwell, Brockport, N. Y.

EXCLUSIVE Home movies. Select films. Write for free lists. Home Pix, 1674 Broadway, New York 19, N. Y.

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SOURCES: Where to buy (or sell) thousands articles, supplies, etc. Folder free. Reinhardt's, Ashburn, Georgia.

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PROFIT Now! Substantial earnings made in magazine subscription sales. Trade price list and supplies free. Instructor Subscription Agency, Dept. PM, Dansville, New York.

EXCITING Details, shows "how" you make big profits with our fast-selling new lines! Plastic tablecloths, aprons; personalized, cotton pillow cases, many other sales-appealing items, novelties! Write for big discount price list, "Special Deals." Hurry! Royalty, Box 748-A, Passaic, N. J.

$4 PROFIT Each sale; deluxe auto seat covers; no investment; big earnings; bonus. Free sales kit. Smart Fit Manufacturing Co., Brooklyn 18, New York.

$2 FIRE Extinguishers. 200% profit. Sample $1 postpaid. Lorrac Products, Box 1086, Albany 1, N. Y.

EXCELLENT Opportunity for men and women. Sell beautiful chromeplated monograms for cars, motorcycles, luggage, purses, wallets, keychains, etc. Contact Charleston Monogram Co., P.O. 1291, Charleston, W. Va.

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MAKE Money in your spare time! Helps furnished. Easy sales. Voluntary repeat orders. Liberal commissions. Send for free wholesale price list today! Write McGregor Magazine Agency, Dept. 12, Mount Morris, Illinois.

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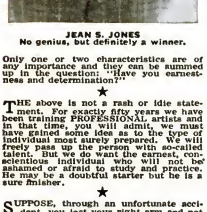
Genius—NOT WANTED

AN ANNOUNCEMENT OF PROFESSIONAL OPPORTUNITY of Special Importance to Earnest, Determined Individuals Who Wish to Become Professional Artists in 1948!

BECOMING a professional artist is NOT a matter of chance or the fortune of birth. Inborn talent for drawing, financial condition, age, sex, education count for very little in the making of an artist.



JEAN S. JONES
No genius, but definitely a winner.

Only one or two characteristics are of any importance and they can be summed up in the question: "Have you earnestness and determination?"

★

THE above is not a rash or idle statement. For exactly fifty years we have been training PROFESSIONAL artists and in that time, you will admit, we must have gained some idea as to the type of individual most surely prepared. We will freely pass up the person with so-called talent. But we do want the earnest, conscientious individual who will not be ashamed or afraid to study and practice. He may be a doubtful starter but he is a sure finisher.

★

SUPPOSE, through an unfortunate accident, you lost your right arm and not only had to learn to write all over again with your left hand but decided to become a professional artist. You will agree that the undertaking would be no easy one—that a lot of perseverance would be required. Yet, we have among our students a woman who did exactly that and prepared herself capably for PROFESSIONAL arti

★

SUPPOSE again that you were a married woman—like the one pictured here—who without particular talent wanted a professional career and financial independence. She, like hundreds of others who relied upon us, combined average intelligence with earnest spare-time study to gain PROFESSIONAL skill WITHIN a year.

★

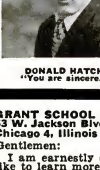
OR, suppose you were a man of fifty who had not lost the ambition to enter a profitable and interesting profession. There are many like Mr. Caresga, shown here, who by determination alone achieved that goal—at the stage in life when time means everything.

Want a job in art in 1948? Want to draw, paint, illustrate for MONEY? Want a PROFESSIONAL income, that will steadily grow?

The crying need today is not alone for steel, automobiles, new dwellings; it is also for artists. Artists must illustrate the thousands of books and periodicals that appear yearly. Artists must provide the laughs that the public demands in gag-cartoons and comic strips. Artists must draw and design the many new products of this industrial age. The demand is staggering. To cash in, it is only necessary to get PROFESSIONAL training.

★

And that's where we come in—to give the serious-minded student professional skill without waste of time, energy, or money. For complete details concerning this remarkable professional opportunity and the spare-time study program that will prepare earnest, determined individuals for PROFESSIONAL life in 1948, write for our free, illustrated book—BUILDING A FUTURE. You may have it now—without obligation—if you wish to make 1948 YOUR year. Use the coupon below.



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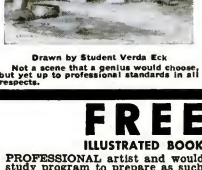
"You are sincere."

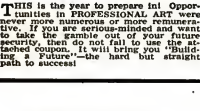
MUTUAL RESPECT

An earnest student is sure to recognize and appreciate sincere help. Student Donald Hatch of Waddington, N. Y. writes: "Once before I enrolled for a course but it was a fraud. I can see that you are sincere. I am more than pleased."

ALVARO CARAEGA
After fifty—a bright vista.



Drawn by Student Verda Eck
Not a scene that a genius would choose, but yet up to professional standards in all respects.



Drawn from life by
Student Wallace B. Jones
Training, practice bring professional skill.

THIS is the year to prepare in! Opportunities in PROFESSIONAL ART were never more numerous or more remunerative. If you are serious-minded and want to take the gamble out of your future security, then do not fail to use the attached coupon. It will bring you "Building a Future"—the hard but straight path to success!

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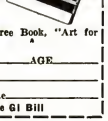

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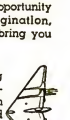

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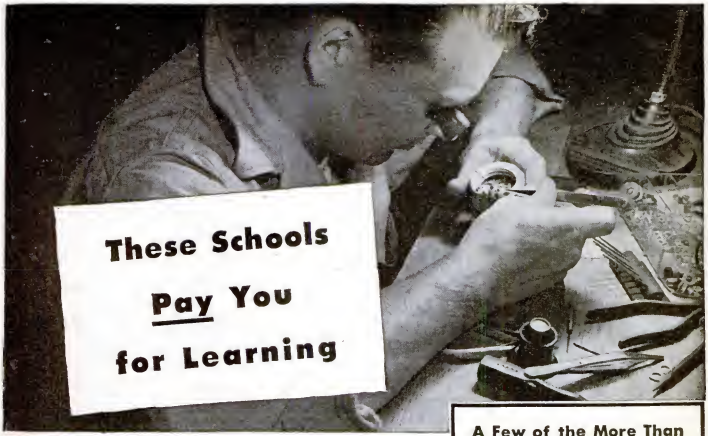

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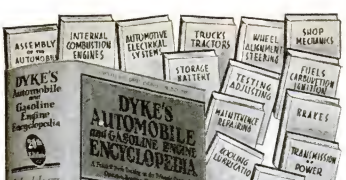

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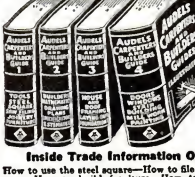

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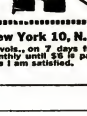

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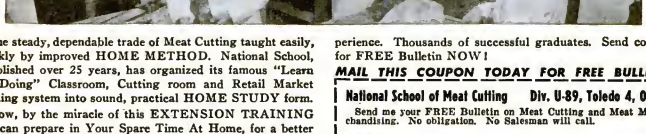

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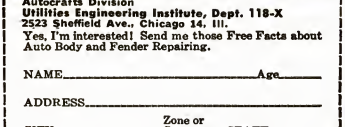

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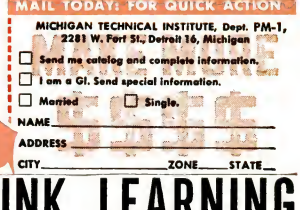

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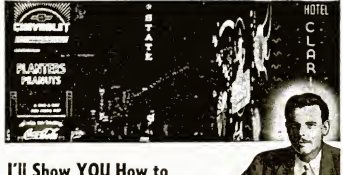

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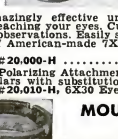

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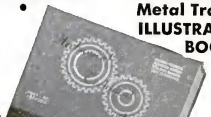

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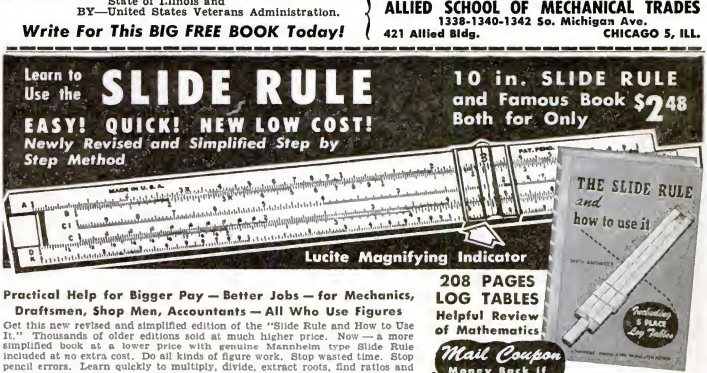

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POPULAR MECHANICS JANUARY 1948
WRITTEN SO YOU CAN UNDERSTAND IT
VOL. 89 NO. 1

Converted lumber carrier rolls along highway with two reels of cable during construction of coaxial line

THE "COAX" HAS NERVES

By Thomas E. Stimson, Jr.

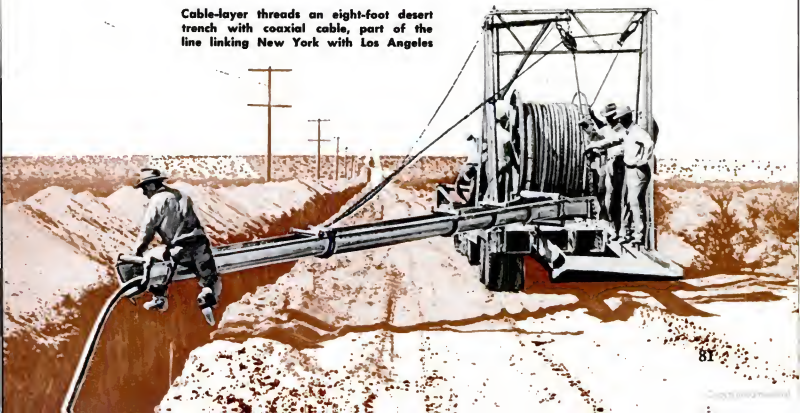
THE NATION'S NEW 3000-mile telephone line has a nervous system like a man's. Every time a slight break occurs anywhere along the transcontinental coaxial cable, the system has all the symptoms of a pain. A signal shoots along its nerves, telling trouble shooters across the country that the doctor's needed. Damage by sleet, earthquake, flash flood or lightning sends "shooting pains" to sound the alarm.

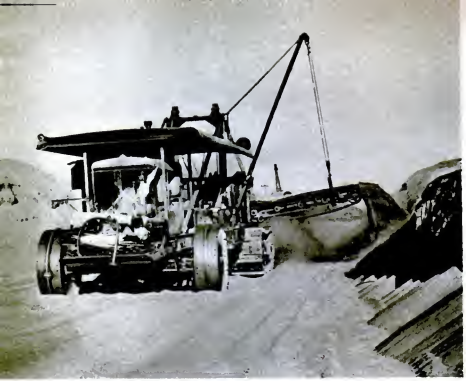
Linking New York with Los Angeles, the coaxial cable is no thicker than your arm in the size laid along most of the route. Yet it can carry as many as 1300 telephone conversations and 2500 teletype and telegraph messages at once. With auxiliary equipment it will carry an even greater load or, when the time comes, it will transmit three television programs each direction at the same time.

Not only does the cable call the doctor to repair its own injuries, it makes various routine repairs to itself.

Suppose a mythical businessman named Brown of Pittsburgh is quoting prices over the phone to a customer on the West Coast. Almost anything could happen along the cable that carries his voice. For example,

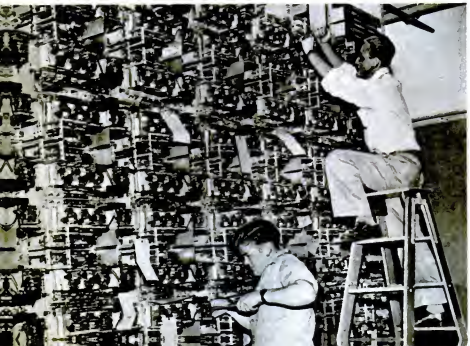
Cable-layer threads an eight-foot desert trench with coaxial cable, part of the line linking New York with Los Angeles





Mountains of sand are shoved aside to bury cable underground. In dunes like these, a wide trench is cut down to "natural" earth, sometimes 30 feet deep, before the final trench is dug

Cable is floated on river, trench water-jetted across bottom and cable is sunk. Below, small section of equipment at terminal. Right, method of laying cable across earthquake fault



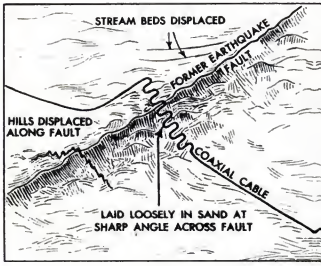
the filament of a relay tube in a lonely repeater station on the Texas plains may burn out just as Mr. Brown completes the connection. His voice won't even falter. A companion tube connected in parallel automatically takes over his circuit and hundreds of others if the first tube fails.

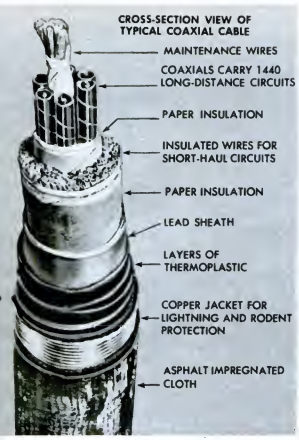
A sleet storm in Maryland may be dragging wires from overhead crossarms, but the coaxial cable, buried underground, isn't affected by the vagaries of the weather. It isn't even subject to temperature extremes. The whole system is insulated against heat and cold.

The power source that serves a wide area in New Mexico through which the cable passes may fail suddenly while Mr. Brown is quoting prices. His customer will continue to hear every word, for the cable doesn't rely on local power sources. Inside is a power line, energized to as high as 2000 volts, to light the amplifier tubes and furnish plate current at repeater stations.

Farther west an earthquake may choose this moment to disrupt utilities, but the temblor won't affect the impulses that carry Mr. Brown's voice across the country. At known earthquake faults the cable is laid at a sharp angle with slack so that it can pull and slip without breaking.

Just as Mr. Brown is bidding his customer goodbye a burrowing gopher in Arizona may start to chew the cable. The rodent merely chips its teeth on a corrugated copper jacket that protects the inside wires. The same jacket a few seconds before may have helped dissipate the tremendous





Coaxial cable (stripped at left) can carry more signals than three ordinary cables at far right

energy of a lightning bolt that struck near its right-of-way across North Carolina.

Flash floods can't rip out the cable, for it is buried and securely anchored under the streams it crosses. Stray electrical currents in the ground won't affect it because the cable carries its own cathodic charge. Not even a boulder or snag that might break the cable beneath the turbulent Colorado River could cut off communications, for a duplicate cable some distance downstream also is energized.

If the volume at a repeater fails, robot volume regulators attempt to restore the volume to normal. If the volume didn't fall too low it will be restored without notice to the mother station. But if it's too big a job, or if transmission is interrupted, the

Technician raises portable antenna above test car in search for radio phone site in Death Valley

regulator notifies the mother station that it can't correct the condition and the mother station then switches to the spare "coax" which is always standing by. The switch is made so fast that neither Mr. Brown nor his customer will notice it.

Still another warning signal is flashed to the nearest trouble board if the sheath around the cable becomes torn. The entire cable is filled with nitrogen gas under pressure. The alarm sounds if the gas pressure falls below a certain point. Measurements are made to determine the location of the leak, and during repairs additional gas is forced through the cable, flowing out at the break to prevent the entrance of moisture that might disrupt service.

The coaxial cable consists of either six or eight copper tubes, each about as big around as a pencil. Each contains a central wire held in place by insulating disks spaced an inch apart. By use of the carrier principle, hundreds of conversations can be carried over a pair of tubes simultaneously. Each conversation is stepped up to a certain high frequency so that no conversation interferes with others that are being transmitted at other frequencies. This is comparable to the way radio stations broadcast at the same time without interfering with each other because they are on different frequencies.

At the receiving end, the message is switched off the coaxial

← Coaxial network will carry hundreds of conversations between New York and Los Angeles. Branches will run to other cities

tube by an apparatus that is tuned to the frequency of the circuit. Normally, three pairs of tubes in the cable are to be in service while the fourth pair will stand by for use if any of the others fails.

Actually, no one knows exactly how many circuits can be carried by the "coax." When the cable was designed it was estimated that each of the three pairs of tubes could carry 480 conversations, or 18 telegraph circuits in place of one phone circuit.

Recent improvements to auxiliary equipment stepped up the estimate to 600 voice channels per pair of tubes. Now this figure can be multiplied by four if the number of repeater stations is doubled. In peak future use the cable will carry an estimated 7200 simultaneous conversations. At present only a few hundred circuits are activated.

In addition to the tubes, the cable carries a core made up of copper wires for maintenance communication. The alarm circuits are included in the core together with other telephone systems. One set of wires may be

Right, splicer connects ends of two coaxial cables

↓ "Plow-in train" carries the cable, digs the trench, lays cable and covers it with earth in one operation

used by a cableman along the right-of-way for talking to the nearest station. A second connects the repeater stations with the mother station, and an express circuit is used for communication between main stations about 150 miles apart. Finally, a superexpress circuit connects major stations including New York, Atlanta, Dallas and Los Angeles.

The cable is designed to handle a number of "short haul" circuits in addition to its main transcontinental job. A thick layer of paper-insulated wires runs through the cable around the coaxial tubes. The wires carry as many as 198 voice-frequency circuits and later they will transmit some 200 low-frequency circuits for local calls along the line.

Those portions of the cable that are laid in existing telephone ducts are protected by a heavy lead sheath. Cross-country sections that are buried in the earth are further protected by two layers of rubber-like thermoplastic material and a corrugated copper jacket. These in turn are covered by an outer coat of cloth impregnated with asphalt. Wherever the cable crosses a river it has two additional wrappings of wire.

The transcontinental cable, extending from New York to Los Angeles via Atlanta, Dallas and El Paso, is now complete and in use except for a section between Atlanta and Charlotte, N. C.,

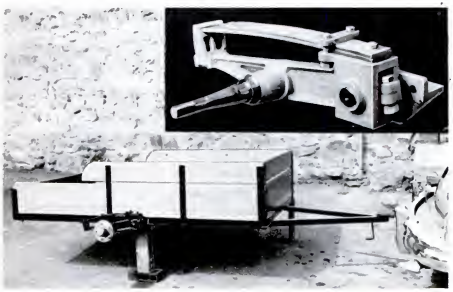
(Continued to page 268)

PLASTICS INVADE THE ARTS

Sculptors have a new medium—plastics that can be tinted or dyed to resemble marble, bronze, granite, aluminum or almost any material. The material, phenol resin, can be carved or cast. Work on the first plastic casting is shown here. Above, sculptors complete a head of Dr. James E. Pyle, director of the General Electric Chemical Laboratory where the process was perfected, before making the plastic casting. The head, modeled in Plastalina, which does not dry out as rapidly as clay, is used for making a plaster mold. The mold, made of two coats of plaster, is dried and painted with a special black paint to fill the pores of the plaster. Left, phenol resin, heated to 200 degrees, is poured into it. Splash bubbles are avoided by pouring along a glass rod. When full, the mold is baked in an oven heated to between 160 and 180 degrees for five days to cure the plastic. Lower left, the mold is cut open with a chisel. Below, after the surface has been smoothed by brushing and sandblasting, the plastic head looks like ivory. The mottled base is of the same material, but a black dye was added to the liquid plastic before casting

Plane Minus Wings Becomes Diner

Roadside diners once were made from old rail cars, but Herman C. Weist of Louisville, Ky., has given the idea a new twist by building a diner from a surplus C-54 plane. Few changes have been made in the exterior appearance of the fuselage, but Weist cut off the wing and tail sections. Inside the fuselage are a bar and eight tables with seats for 42 patrons. The rest of the interior is divided into a kitchen, washrooms and a counter. Three 50-foot flatcars were required to move the plane from Arkansas, where it was purchased.



Knee-Action for Trailer Supports 1500 Pounds

Knee-action for trailers is provided by a spring-suspension system that will carry a 1500-pound load. The individual unit consists of a short axle fastened to a casting which is bolted and shackled to a short steel spring. The axle is held in place by tension on the spring. The unit is installed by bolting it to a channel iron. As each wheel is individually suspended, the wheels may be staggered to provide an easy riding trailer.

Flaming Hoop Heats Steel For Welding Operation

Looking more like the circle of flame in a circus acrobat's act than an industrial technique, a huge gas burner is used to preheat ball-mill cylinders for welding. The shell, made of armor plate and mild steel, is heated evenly by hundreds of pinholes in the gas tube. The arc welder works on the opposite side of the cylinder.

Information, including manufacturers' names, concerning products described in this issue may be obtained by writing Bureau of Information, Popular Mechanics, 200 E. Ontario St., Chicago 11

Skiers AWAKEN A Bonanza Town

Perhaps you don't know Aspen, Colo., but it's a town of superlatives. Once site of the richest silver mine, it has emerged from quiet old age as a sports area with the world's longest ski lift

By Aubrey O. Cookman, Jr.

AFTER half a century, Aspen, Colo., is a boom town again. The spark that set it off this time was completion of the world's longest chair lift for skiers, instead of the world's richest silver horde.

In 12 years after the original 1880 strike, its mines turned out $44,000,000 in silver and lead. One, the Mollie Gibson, was the richest in the world. The tiny camp, nestled nearly 8000 feet up in the rugged Rockies, overnight became the state's second largest city, with a population approaching 30,000. It had three daily and two weekly newspapers, seven fine churches, elegant hotels, an opera house, two railroads, schools, hospitals and a race track. Nor, like any bonanza town, did it lack a flourishing collection of saloons and gambling palaces.

Despite its spectacular growth, the town was carefully platted, with wide, tree-lined streets, parks and substantial public buildings. Its Victorian-style homes were well built and filled with furniture, brocades and tapestries from Paris. Guests at the Hotel Jerome were lifted by a water-powered elevator, a mechanical sensation of that day. Ordinary things couldn't satisfy the suddenly wealthy prospectors.

Remindful of the town's silver heyday, "gingerbread" Victorian architecture still prevails in Aspen. Free paint was given householders to help rejuvenate town

Aspen's "crash" came in 1889, when Congress restricted the coinage of silver. One by one mines closed, homes and shops were abandoned and fire nearly destroyed the Wheeler Opera House. To hasten the exodus, gold was discovered at Cripple Creek in the Denver region. Though a thin trickle of mining activity continued and a growing army of anglers was attracted to the region's streams, the town steadily dwindled to a shell of its former eminence. By 1940 only 400 remained, of whom one fourth were pensioners.

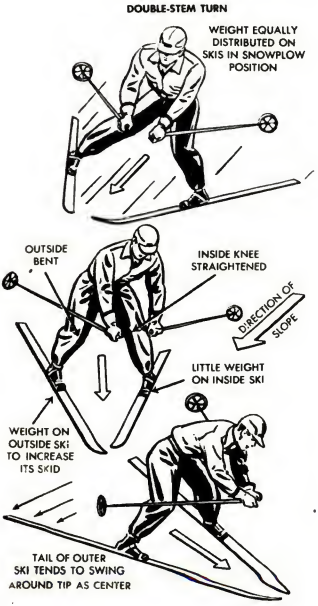
The seeds for Aspen's rebirth were sown in 1935, when Swiss expert Andre Roche labeled its skiing possibilities the best in North America, and further nurtured in 1939, when Chicago industrialist Walter

Grouped around the sun deck at the top of the 14,000-foot lift, skiers enjoy a panorama of the snow-covered Rocky Mountains

Friedl Pfeifer, head of the ski school, demonstrates a pole-jump turn. He was one of the many Camp Hale ski soldiers who returned to Aspen

HERRINGBONE

In this maneuver, used for short, steep ascents and narrow trails, the weight is on inner edges of the skis. Trailing ski is lifted ahead over rear of forward ski



P. Paepcke first saw and was "conquered" by the region's beauty. Another potent factor was the establishment of Camp Hale nearby as a wartime training center for ski troops.

Paepcke and those he interested saw it as a "complete community" and cultural center, with sufficient industry to keep it prosperous the year around. Along with artisans who'd make it a native crafts center, they wanted to attract writers, artists, musicians and scholars who would give it fine music, theater and educational opportunities. The quaint flavor of its Victorian architecture was to be preserved in new and restored homes, even to offering free paint to old residents who would follow a recommended color scheme.

To start the ball rolling, they wanted a spectacular attraction to exploit their most popular asset, near-perfect skiing. Given a healthy start, they were confident the rest of their hopes for the town's renaissance would be completed. The answer was to build a chair lift for skiers—the longest in the world!

Erecting it from the streets of Aspen to the 11,400-foot top of Ajax Hill was a major engineering feat, but it was hustled through from survey to dedication in less than a year. Passengers, most of them wearing skis, are "scooped" up in individual chairs suspended from a cable. During a 30-minute ride to the top, they gain 3500 feet in altitude. The lift's capacity is about 275 an hour.

Moving noiselessly and alone through space, above a carpet of white snow, green pines and aspen, some describe the trip as being "like a ride to Heaven." Sometimes the treetops are just a few feet below the ski-shod riders, while at others the chairs are 85 feet above the ground. Riders travel more than 500 feet a minute, in complete safety.

The lift is in two sections, with the 8400-

GELÄNDESPRUNG

Useful in clearing obstacles, for this maneuver both poles are swung forward and planted in snow. As skier springs, knees are brought up, skis are almost at same level as tops of poles

In slalom racing, above, contestants travel down a narrow, twisting course between flags arranged in rows or pairs. They reach speeds approaching a mile a minute. Below, passengers at the lower end of Aspen's lift are scooped up, skis and all, and carried 14,000 feet to the top in a 30-minute trip. Riders gain 3500 feet in altitude

foot lower one the longer, and passengers walk just a few yards to transfer. In contrast to the upper, the lower section is a monocable system in which chairs hang from the same inch-thick cable that pulls them up. On the bicable upper section, the chairs are suspended from one cable and pulled forward by another.

At the upper terminal of each is a rubber-grooved wheel 10 feet in diameter, driven by an electric motor, around which the continuous cable is turned. At the lower ends are weighted tension stations, with similar grooved wheels, around which the cables travel.

Spaced along the 14,000-foot route are 46 steel supporting towers, with two or four pairs of rollers to guide the cables. They vary in size, according to their location on the mountain's profile, and are mounted in concrete bases averaging six feet thick, sunk below topsoil.

Though the swift, and sometimes steep, ride is thrilling, it isn't dangerous. The lower cable is tested to hold more than 40 tons, about six or seven times what its filled chairs generally carry, and the upper cable can support more than 12 times its usual load. According to its builders, the Heron Engineering Company of Denver, parts of the cables will be removed every five years and sent to laboratories for exacting tests. All the

Novices have plenty of "elbow room" for practice on the new slope. A T-bar tow pulls them to top

wheels they operate on are rubber filled.

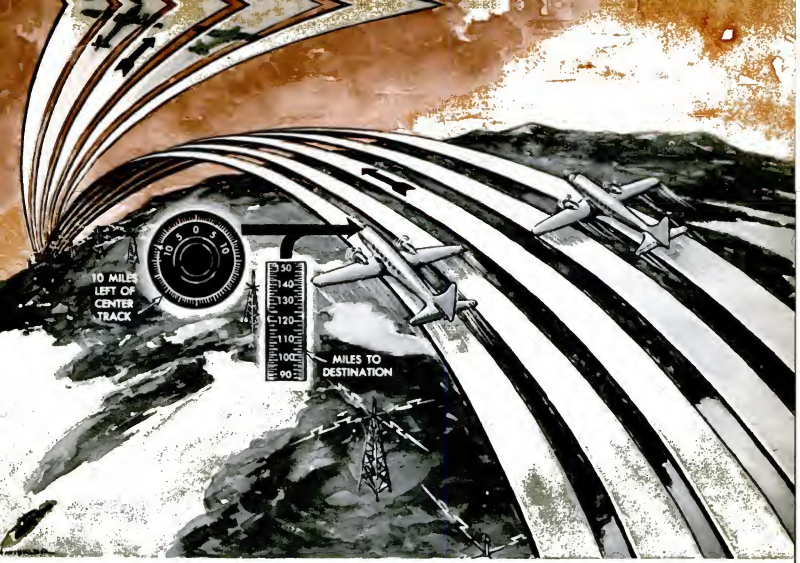
The tubular steel chairs have arms, a hinged safety bar that swings across the front and a rung for feet or skis. For protection against wind or snow there are canvas hoods. Since both sections are two-way, with chairs constantly circling back to pick up new customers, the lift gets a good play from nonskiers, from 8 to 80 years old, who want an unequaled view of the gorgeous mountain panorama.

The skiers' reward at the top is the fine, powdery snow they prize and an assortment of excellent trails, starting from an octagonal-shaped sun deck. The shelter's unusual design, incidentally, helps provide water for its restaurant. The roof is concave, so that trapped snow is made to course toward a flue in the center, a flue which passes down behind a five-sided fireplace, melting the snow.

For the more skilled at Aspen there is the famed Roch Run, scene of the 1941 national championships; Gentlemen's Ridge, Little Annie Basin and others. To answer an initial criticism that most of the courses were too tough for beginners, a gently sloping practice hill, 2200 feet long and 400 feet wide, was cleared. Called Little Nell, a

(Continued to page 260)

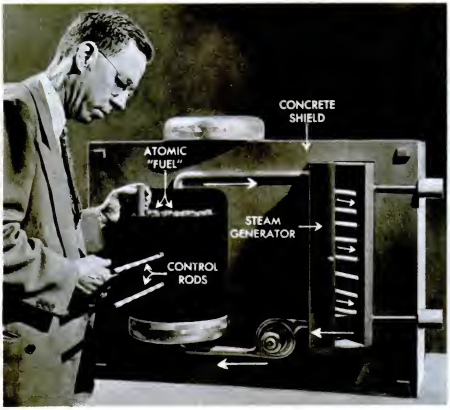
Chairs on the lift's upper section hang from one cable and are pulled by another. The cable will support more than 50 tons



Electronic Guide Widens Air Lanes

Artist's drawing illustrates how the computer, a test model of which is shown below, widens beam into multiple-lane airway

Air traffic lanes can be made 10 times as wide, "stacking" eliminated and schedules followed precisely with an electronic navigator called the B-D Computer. The B stands for bearing and D for distance. Instead of flying directly down the beam, the pilot sets into it an off-course calibration of 5, 10 or more miles to the left or right of the center "track." When given flight instructions, he need only turn a dial to the designated miles off course. The device compensates for wind variables in flight and automatically holds the plane on track to the destination. With this parallel spacing, 10 times the present number of flights can operate at the same level. The computer's operation depends on signals received from two radio transmitters located together at a known reference point. One, similar to Shoran, gives the plane's distance from the point; the other indicates the plane's direction from it. Changes from one ground reference station to another are made automatically as the flight proceeds. An estimated-time-of-arrival dial and a mileage-to-destination indicator keep the pilot constantly informed of his progress. The computer's developer, Minneapolis-Honeywell Regulator Company, likens its action to "widening a single-lane country road to a 10-lane superhighway."



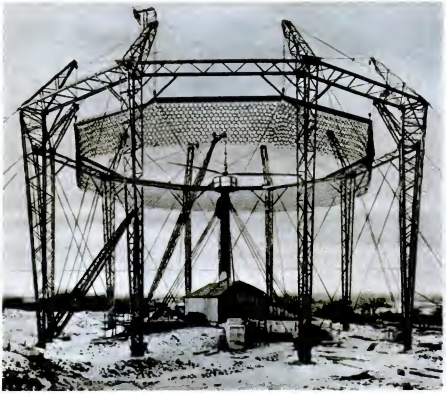
Model Power Plant For Atomic Energy

Peaceful use of atomic energy is forecast by a model power plant using a heat-exchanging fluid to eliminate the danger of atomic radiation. Constructed by General Electric, the model is not built to scale, but it does show a proposed method of harnessing the power of the atom for turning the wheels of industry. The heat-exchanging fluid is pumped through the atomic pile and into a boiler where water is converted to steam.

Scientist lowers fuel rod into atomic pile. Controls regulate atom-splitting that heats fluid pumped through generator coils

Auto Sunshades of Plastic

Transparent sunshades for the side windows of automobiles protect occupants from the direct rays of the sun without obstructing their view. Made of plastic, they are attached permanently to the door and give protection from rain and snow as well as the sun by overhanging open windows. The shades, which are available in blue or green plastic, permit hinged ventilation windows to be opened.



Rotors "Test Flown" On Spinning Tower

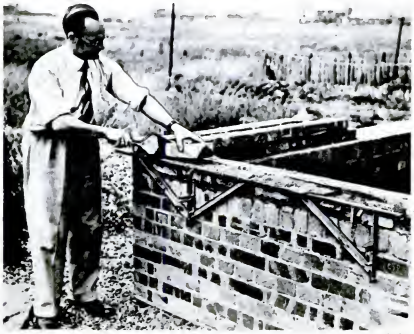
Flight conditions more severe than those likely to occur in the air can be simulated by a test tower for helicopter rotors at Filton, England. Rotors with blades up to 60 feet in diameter are mounted on the 50-foot tower and driven by a 1000-horsepower motor. Any flight angle can be duplicated by adjusting the tension of six double cables supporting the tower. Netting suspended from a ring of 70-foot pylons around the tower acts as a safeguard against blade accidents. The netting can be adjusted to fit any rotor position.

Contact Printer Kit

Photographers can make a contact printer with a kit that requires only a screwdriver for assembly. The printer will take negatives from 35 mm. to 4 by 5 inches. A sponge-rubber platen holds the negative and paper firmly in position. Operated by the platen, an automatic switch controls the printing bulb and safelight.

Industrial Microscope

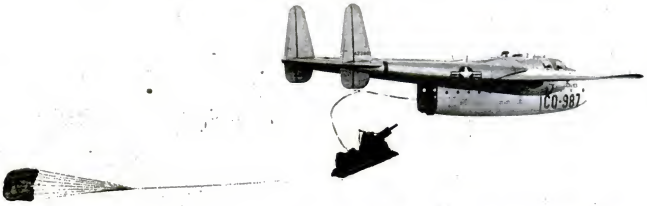
Holes as small in diameter as a human hair are drilled accurately when the operator watches the process through a new industrial microscope. Specially designed for manufacturing processes, the microscope has two eyepieces through which the magnified image is seen without distortion or inversion. The microscope is used in such exacting operations as drilling holes in Diesel injection jets and assembling miniature radio tubes.



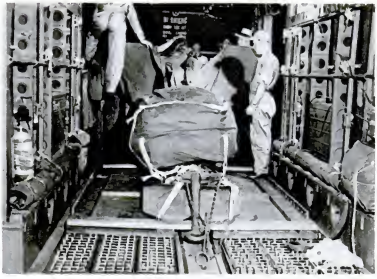
Fox photos

Bricklaying Speed Is Increased With Metal Guide

With a metal guide invented in England, bricklaying time is cut more than half. Replacing level and plumb lines, the guide clips on the top course of brick and has built-in spirit levels. In tests, the inventor laid 100 bricks in 30 minutes, the equivalent of 1600 bricks in a day. Normal rate with the old method is about 500 a day.

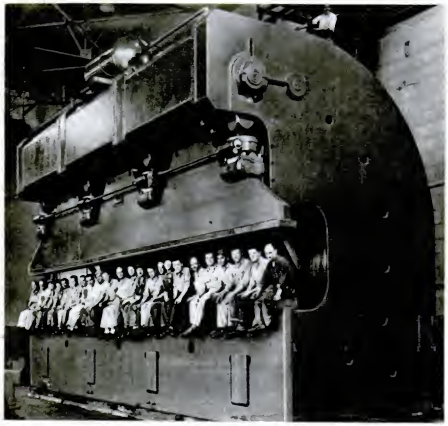


Huge Howitzer and Jeep Parachuted From Plane



Fairchild Aircraft photos

Army field equipment weighing more than 3½ tons is ready for immediate action after being parachuted to earth from a C-82 transport. Tests at Ft. Bragg, N. C., to develop techniques for dropping bulky airborne materiel, were conducted with a 1½-ton jeep and a 4400-pound 105-mm. howitzer. Both were mounted on wooden platforms resting on rollers and loaded on a C-82. A tiny, spring-released chute was first out, pulling a 16-foot ribbon-type parachute which jerked the equipment from the plane. As soon as the big gun was clear of the twin tail booms, two 96-foot canopy chutes billowed out to lower it to the ground. A single 96-foot parachute was used for the jeep.



Giant Press Brake

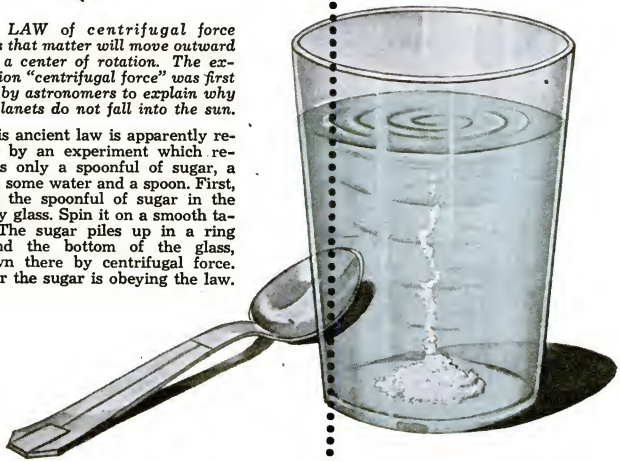
Exerting a pressure of more than 1000 tons, a giant mechanical press brake bends a right angle in a ⅝-inch steel plate up to 36 feet long in a single stroke. The brake, built by the Warren City Manufacturing Company, will be installed in a steel plant. Weighing 500,000 pounds without dies, it is more than 36 feet long, 16 feet wide and 20 feet high. The machine makes 15 strokes per minute, with all moving parts counterbalanced by air cylinders. A 75-horsepower electric motor drives the 10,000-pound flywheel at 450 revolutions per minute. The machine is controlled by one operator.

TEST YOUR SCIENCE i.q.

By Rex Taylor

THE LAW of centrifugal force states that matter will move outward from a center of rotation. The expression "centrifugal force" was first used by astronomers to explain why the planets do not fall into the sun.

This ancient law is apparently refuted by an experiment which requires only a spoonful of sugar, a glass, some water and a spoon. First, place the spoonful of sugar in the empty glass. Spin it on a smooth table. The sugar piles up in a ring around the bottom of the glass, thrown there by centrifugal force. So far the sugar is obeying the law.



THEN

Here comes the test which seems to disprove the law. Take the glass containing the spoonful of sugar and add cold water (or any chilled liquid) and stir rapidly with a spoon. After vigorous stirring, remove the spoon. According to the law of centrifugal force the rapidly spinning liquid should throw the sugar outward to the wall of the glass. But it doesn't! The sugar collects in the center. Why?

Is there a flaw in the law of centrifugal force?

Answer on Page 230.

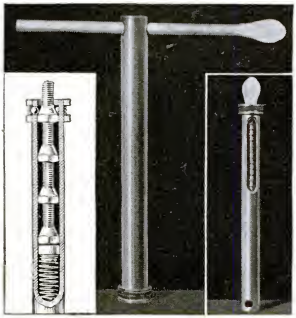
Head-bolt heater makes motors start easily in sub-zero weather by warming the water in the block to driving temperature. The heater, a long bolt with an immersion element on the end, replaces a standard head bolt in the engine. When the extension cord on the heater is plugged into a 110-volt outlet, the heater warms the engine to quick-starting temperature in 30 minutes. A permanent installation, the heater is tightened into the block like an ordinary head bolt.

Brake-pedal depressor eliminates the necessity for a second man to hold down the brake pedal during brake alignment inspections. Suitable for use on any type of car or truck, the depressor is quickly adjusted to a variety of lengths. The forked end of the all-metal tool is centered on the pedal and the long shaft pushed forward until the brake is applied. The upper bracket has a friction catch that locks it in place against the seat cushion to hold the pedal down. In addition to its use during brake alignment inspections, the depressor can be used when checking casters or kingpin inclination.

Motor-oil pump dispenses lubricating oil without the bother of cans or bottles. The oil is pumped directly into the crankcase through a flexible hose like those used on gasoline pumps. At the nozzle end of the hose is a meter that shows the quantity dispensed in gallons and quarts. The hose retracts inside the dispenser body when not in use. Several pumps are connected as a unit to provide a convenient supply of various oils. The dispenser speeds up oil changes and reduces spillage and waste.

FOR MOTORISTS

Built-in hydraulic jacks that operate automatically when a control knob on the dashboard is turned make changing a tire almost a pleasure. The 1948 Princess and Sheerline models of the Austin have this convenient feature incorporated into the chassis. Without getting out of the car, the driver can jack up both front wheels, both rear wheels, or all four wheels. The jacks are connected to a separate hydraulic system and are located on each axle near the springs. Both models are in the luxury class and were especially designed for the American market by Austin, England's largest manufacturer of motor cars. Two less expensive models do not have the automatic jack feature. These smaller cars have 40-horsepower motors and cruise at 65 miles an hour. All four models were built with a left-hand drive for American use.



Lugs can't be lost when a new lug wrench is used for changing tires. The wrench is made of heavy tubing and the lugs push inside against a spring to be retained until reinserted in the drum. A spring-loaded plunger moves the lugs forward one at a time and they are held in position for replacement so that it is unnecessary to handle them at all. A spade end on the handle, which slips inside the tube when not in use, removes hub caps without marring them.

Gap-setting tool for spark-plug electrodes has eight retractable feeler gauges and a heavy electrode-bending fixture. Small enough so that it can be carried in the mechanic's pocket, the tool is sturdy and rustproof. Selection of any one of the eight wire gauges is done by a micrometer-type selector at one end of the tool. The gauges range in size from 15 to 40 mils to provide accurate gauging of standard gaps. When not in use, the wire feelers can be retracted into the aluminum body of the tool. The bending fixture, made of hardened tool steel, has four slots milled to fit all sizes of regular ground electrodes. Over-all length of the tool is 3¾ inches and its weight is 1¼ ounces.

Beech Aircraft photos

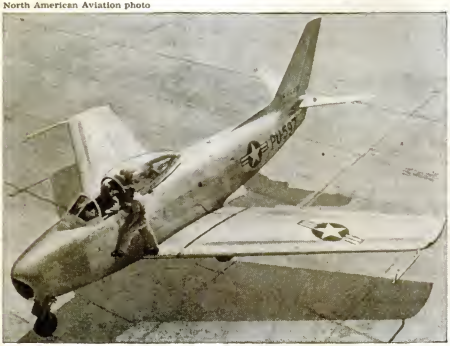
Transport's Four Engines Turn Just Two Propellers

Four engines buried in the wings run the two propellers of Beechcraft's Model 34 Twin-Quad. Other unusual features are built-in emergency landing keels and a V-type tail for large planes. The new model carries up to 20 passengers or cargo, cruises 180 miles an hour and has a 1400-mile range. A combined bulkhead and door as well as seats can be shifted in a few minutes to vary the proportions of passenger and cargo space.

Air Force's Swept-Wing Jet Fighter Gets Tactical Tests

With the XP-86, the U. S. Air Force gets its first chance to explore the tactical possibilities of swept-wing fighters. The six-ton jet was built by North American for speeds in the lower subsonic brackets, below 650 miles an hour, and for altitudes well above 40,000 feet. It has extra large ailerons to offset control problems of the swept-back design and fuselage dive brakes for the approach slow down. The pilot is perched up high, beneath a pressurized bubble canopy. There are three .50-caliber machine guns on either side of the air intake in the nose and facilities for smoke tanks, bombs, rockets and depth charge in the wings.

North American Aviation photo



¶Fifty-one different models of aircraft, including four helicopters, were offered on the civil market last year by 25 American manufacturers, compared with 47 by 29 firms in 1946.

Jungle Home on Wheels

They make their own roads! The Russells plow through miles of tropical underbrush on their camping trips

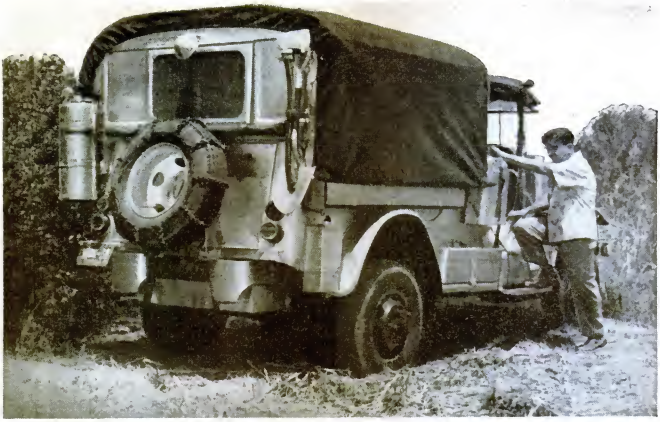
IT TAKES A RUGGED vehicle to plow through jungle underbrush, ford streams and climb steep grades, carrying an adventurous couple, their living accommodations and paraphernalia for treasure hunting, fishing and exploring.

S. Robert Russell and his wife, of Key West, Fla., solved the problem by picking up a used Army command car and adding a hand-built, folding body with trimmings that include most of the comforts of home.

The result is a powerful truck that has sleeping bunks, icebox, dining-room table, typewriter and stand, water tanks and plenty of storage space for fishing and camping equipment.

The Russells found the front-wheel-drive Dodge in a Miami used-car lot. Its canvas cover was torn across the top and the steel bows that framed the canvas were

Sides and tail gate down and ceiling raised, "camp" is ready for the night



Stern view shows compact land cruiser ready for the road. Aluminum paint reflects heat to keep interior cool

bent. One tire was flat, the body was dented in several places and the paint was rough and peeling.

Russell was about to walk away from the car when he decided to check the engine. It sounded smooth and powerful, and the transmission and transfer-gear case were in excellent condition. The running gear showed no looseness due to wear. The tires were fair and the flat needed only air. The vehicle looked like a good gamble.

He bought the car, had it greased and drove the 100 miles to his cottage. The ride convinced him the jalopy was a good buy, and his mind filled with plans for converting it into a land schooner.

Working as a team, the Russells built a new top over the front seat and made a few other emergency repairs. Then they loaded the body with half a ton of sand and set out to test the car's jungle ability.

Driving along a highway, they spotted a road fill that made an ideal testing ground. Powerful brakes eased the car down a steep grade and into heavy jungle-like underbrush. Russell pulled back the lever which engages the front wheels and shifted into low-low.

Gears growled and the car inched forward. A sapling bowed before the weight and power of the vehicle, brush scraped along the side, and branches smacked against the passengers in the open cab. But the machine kept moving at about three miles an hour.

A fallen tree was pushed aside easily, a

← Here's "Tramp" before work started. Below, wheel flange makes winch for tow cable

mud hole was negotiated with all four wheels spinning. After crashing through a stand of young palmettos, Russell turned the car around, climbed the steep grade and rolled down the highway, convinced that the car was a good exploration vehicle.

That was the last ride the Russells took for a month. For 30 days they worked from morning to night—and sometimes under lights—building a body to meet their requirements. Mrs. Russell worked constantly, sawing, hammering, painting and hemming the 7 by 16-foot tarpaulin which was to cover the body.

With no electric drill, the Russells had to drill hundreds of holes through the steel body by hand. Materials were hard to find. The adventurers combed the beaches, removing needed hardware from wrecked ships. A crumbling house trailer supplied an undamaged window.

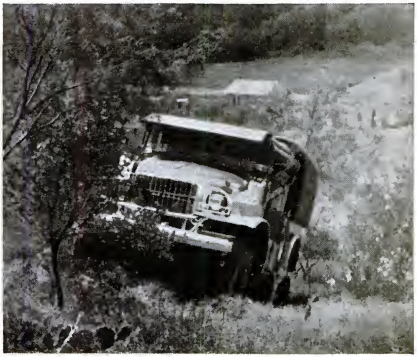
At the end of 30 days the job had been roughed in. Comfortable bunks, complete to mattresses, could be folded snugly into the sides. Hinged extensions to the front and back could be raised, carrying the top with them, thus providing full headroom inside. The entire unit was screened and rainproofed.

Many conveniences remained to be built or installed, but the Russells were impatient to try out their "campmobile." They bought a collapsible stove, several cans of fuel, a five-gallon can for water, a few dishes, and headed for Key West, which was only 30 miles from their cottage on the outskirts of Marathon.

It took them all day to cover that 30 miles because they frequently pulled off the highway to plow through interesting jungle and to drive along remote stretches of beach that never before had felt the weight of a car. At Key West, they cut an opening in the truck body and fitted a 15-gallon water tank against the chassis under the

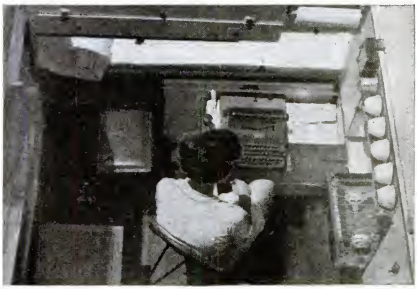
(Continued to page 226)

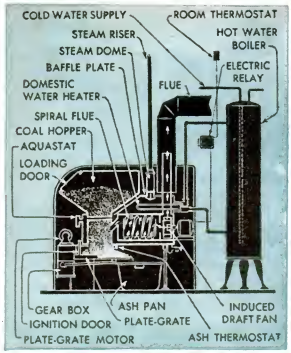
Hand crank can be substituted for the electric winch. The cable will help the "Tramp" across streams or lower Russell down a cliff

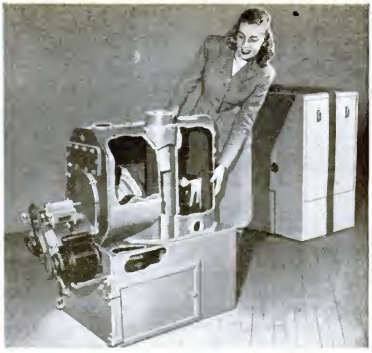


↑ In low-low with all four wheels churning, few grades are too steep

↓ There's no waste space in interior. Dining table slides into channel to reveal typing table. At left, upholstered icebox forms a seat







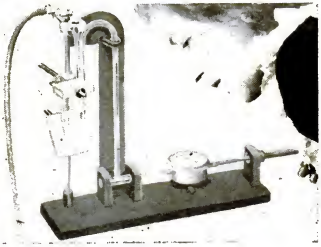
Left, cutaway of hopper-fed boiler-burner that gets more heat out of coal. Right, screw-fed boiler-burner

Boiler Gets 25 Percent More Heat From Coal

Coal produces about 25 percent more heat in an automatic boiler-burner unit developed by the Anthracite Institute. The firebox is completely surrounded by a water jacket, with the heat used secondarily by being drawn off as gas by a squirrel-cage fan. The fan swirls the hot gases against the heat transmitting surfaces of the boiler, breaking through a layer of cooler gases which normally insulates it from the hotter gases. Heat wastage up the flue is much less than in conventional furnaces. Ashes are automatically removed by an agitator that starts working when a thermostat detects ash temperature falling below a set level. Called an anthratube, it is made in hopper and screw-fed models for steam and hot-water heat.

"Flip" Pad Folds Up Old Memos

Months of memo writing are provided by a continuous memo pad mounted on a board that can be flipped over to pull a clean writing surface into position. The writing surface is about equal to a page in most memo pads. Notes are not torn off and discarded, but are folded into the holder. A knob on either side is turned to refer to old notes. Designed for desk use, the pad has a calendar at the top.



Here's a Slow Way to Fill a Glass

Drops of liquid so small it would take 800 years to fill a drinking glass at one drop a second are measured by an ultra-microburet. Used in measuring liquid for microanalysis, the device has a slender piston fitted in a tube filled with liquid. Movement of the piston, expelling the liquid, is measured by a micrometer and this measurement is used to compute mathematically the amount of liquid expelled.

Welder's Hammer Has Flexible Head

Considerable time is saved when cleaning slag from welds with a hammer that has five separate heads attached to the handle so that each can move up and down separately. Thus, one blow of the hammer strikes the weld in five different places along the irregular-shaped surface, the equivalent of five separate strokes with a single-pick tool. The head segments, which can be resharpened on a grinding wheel like an ordinary chisel, are free to slide ⅜ inch and thus wrap the force of the blow around a convex bead, follow the contour of a concave fillet or the surface of crevices in deep-groove welds.

With five free-sliding heads that adjust themselves to the shape of the weld, this hammer cleans slag five times faster than the usual type. It can be used to clean any type of weld

Button in Plane Turns on Runway Lights

Lights at unattended airports could be switched on by pressing a button in incoming planes equipped with a device invented by Vernon L. Mallory of Minerals Wells, Tex. The only extra item in the plane is a box four inches square and weighing about 20 ounces, which plugs into the radio transmitter. Pushing the button sends a tone to a ground receiver about the size of a table model radio, which converts it to an impulse that turns on the lights. Selection of the runway to be lighted is made by a switch connected to a wind sock or tee. A wind shifting midway between runways lights them both, giving the pilot a choice between two cross-wind landings. Operating range can be set by adjusting the receiver's sensitivity. It can be set to cut the lights off after a predetermined period or they can be shut off at the ground receiver

From the suction dredge's 24-inch discharge pipe pours a torrent of sand-laden water

Sandfighters of the Columbia

By Thomas E. Riley

ON THE PACIFIC COAST a perpetual battle is raging between the U. S. Engineer Department and the sands of the Columbia.

For the Columbia is an important navigable river, one of the mightiest in North America. It must carry the huge, barnacled ocean liners to the seaport of Portland, Ore. which actually is 100 miles from the sea.

The Columbia is not a mile-wide stream of meandering water that placidly carries the ships—it is a mile-wide torrent of channel-choking sand that bears the curses of every river pilot who has tried to predict its moods. A tremendous, roaring stream of surprisingly clear water, it contains an enormous amount of sand, and when left unchallenged this overgrown mountain stream playfully wrecks ships, moves channels, and throws sand bars so high under the docks that even a rowboat cannot anchor. Rivermen hate the sand.

The engineers have promised to maintain a channel 35 feet deep and 500 feet wide. They man a fleet of sand-eating ships in Portland's back yard where, practically unknown to local residents, they battle the river 24 hours a day. For eight months each year the fleet fights to keep the main channel to the promised 35-foot depth. The battle must be won in eight months as dredging is virtually impossible during the four months of flood stage.

The dreadnoughts of the fleet are the

Revolving head of the dredge is raised for repairs. It breaks up hard-packed material on the river bottom

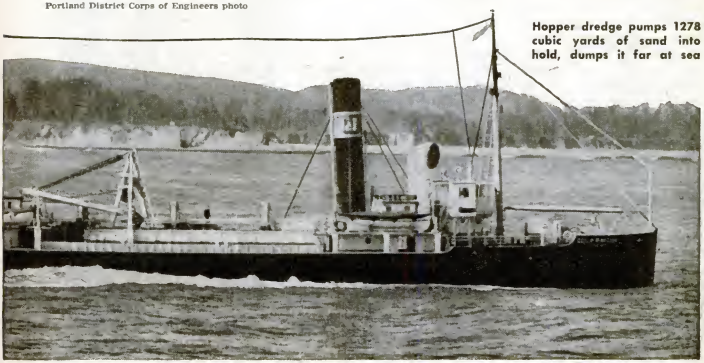
huge hydraulic sand dredges, sometimes called suction dredges. These not only move great quantities of sand but also build dikes and fill lowlands with their discharge pipes to further control the river. There are four in action today: the Multnomah, the Wahkiatum, the Raymond and the Luckiamute.

The Raymond has fought other foes as well as the Columbia. Boarded up to withstand ocean voyages during the late war, she was towed overseas where she downed two enemy planes and shared credit on a third while dredging in Manila Harbor.

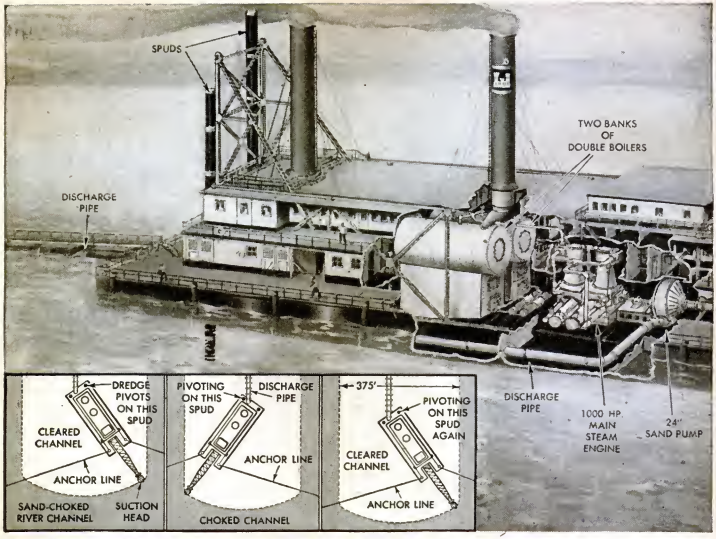
The largest of the hydraulics are the Multnomah and Wahkiatum, sister ships. Each carries staterooms and a galley on the upper deck for the 50-man crew. The lower decks and the holds are crowded with boilers, engines, winches and the centrifugal sand pump.

There are no propellers on these hydraulic dredges—yet they move by themselves. For lengthy trips between dredging sites they must be towed, but when working along the river they travel without

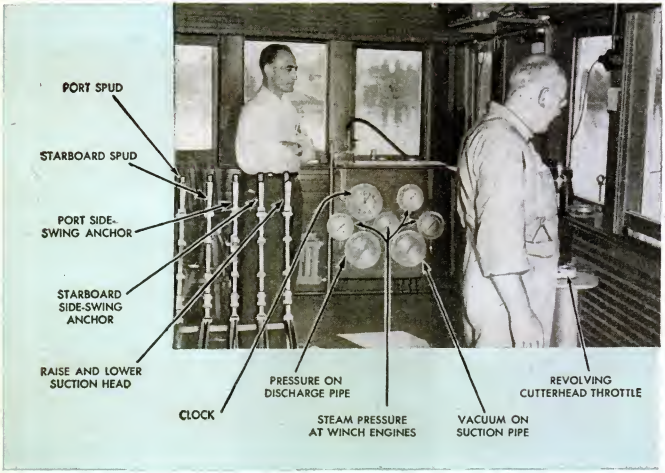
Portland District Corps of Engineers photo

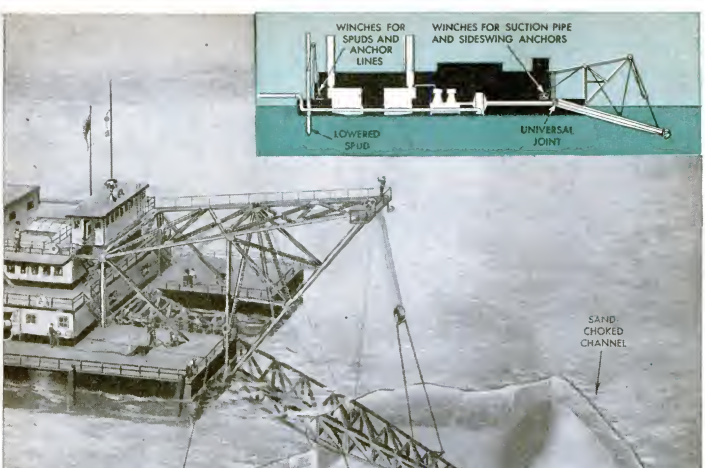


Hopper dredge pumps 1278 cubic yards of sand into hold, dumps it far at sea



Insets demonstrate the dredge "walking on stilts" to move along river. Below, lever room of the Multnomah





Drawing and inset show parts of ship. Cutterhead and pipe pick up sand, which is discharged to form dike

propelling power. As Captain Elton O. Reed of the Multnomah explains:

"People think a dredge squats for a week in one spot. Not at all—a hydraulic walks like a man on stilts and sweeps the channel like a housewife's broom."

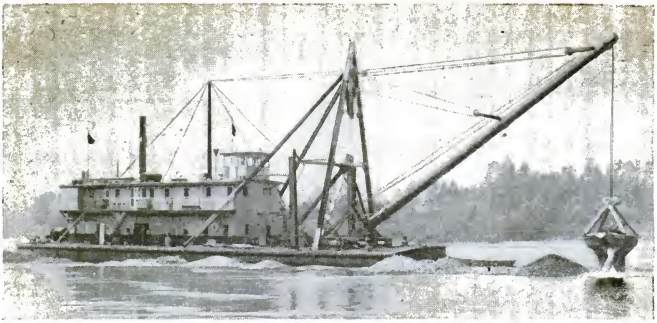
The hydraulics walk on two "spuds," 90-foot timbers, three feet in diameter, that extend down through the stern. One spud is thrust down into the bed of the river like a stiff leg. The dredge pivots sideways on this spud by winching in on anchors far out to the side, bringing the opposite spud a few feet forward as it swings. Then the second spud is lowered and the dredge pivots back in the other direction—stepping itself forward.

As the dredge makes each swing, the gigantic "broom" — the 24-inch-diameter suction pipe in the bow—sucks up the sand, its revolving head (powered by steam) loosening hard-packed material and grinding up small logs and other debris.

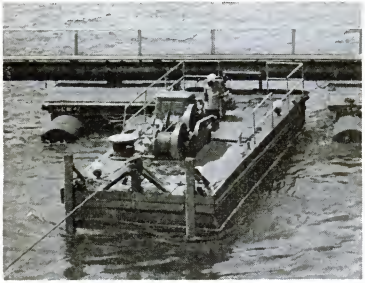
The actual dredging operations are controlled by a single man, the leverman. Standing in the lever room, the pilothouse of a dredge, he controls every winch and pump on the 265-foot craft. Most of the 50-man crew is engaged in moving the anchors forward for the side-swing cables and in moving the pipe line forward along the river bank to follow the dredge—and in maintenance.

"Sand," states Captain Reed, "is the worst enemy any machine ever had. It cuts through the lining of the main pump in 7 to 30 days. And the revolving cutterhead on the suction pipe wears out in about the same time. Inside the pump's bearings we have to maintain 70 pounds of oil pressure, just a bit more than the water pressure, to keep the sand from entering. If that pressure drops for a minute, we're out of action for days. We have a complete machine shop aboard, including a lathe with 12½-foot bed, and we need it!"

The hydraulics also need quite a flotilla of smaller ships. A tug moves the dredge over long distances and tows barges of fuel oil alongside. The dredge itself is so loaded with machinery that only three days' supply of oil for the four boilers can be carried. A smaller tug and a launch move the side-swing anchors ahead. These craft are directed by two-way radio from the lever room. "Sea mules" have replaced the old steam winches on small barges that move and hold the half-mile of discharge



Dredge with a clamshell bucket cleans a Columbia tributary. This type of craft sweeps the channel in congested areas



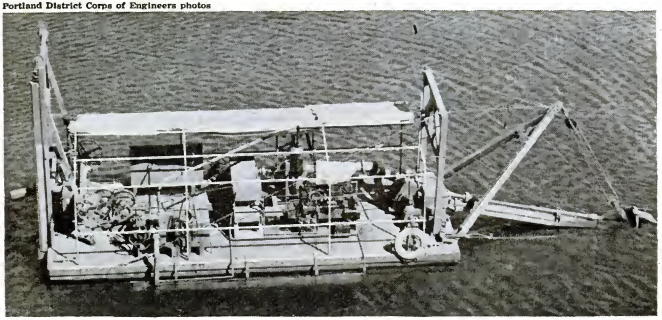
War surplus "sea mule" moves and anchors heavy discharge pipe in the swift current. Below, the PT boat of the sand-eating fleet is a baby hydraulic with eight-inch discharge

Portland District Corps of Engineers photos

pipe in the swift current. These sea mules are war surplus equipment with which our armed forces moved docks and ships in combat ports. Carrying two 1000-foot anchor lines and powerful engines, they could not have been better designed, according to the dredgemen, for handling the heavy 24-inch pipe.

A new hydraulic recently appeared on the river to become the PT boat of the fleet. This miniature dredge was designed to clear small fishing ports along the Northwest coast, and for use on the upper Columbia above The Dalles, Ore., where the river is so swift it clears itself fairly well for the few river boats that chance the dangerous rapids. The dredge is only 12 by 30 feet, although it pumps an 8-inch discharge. It walks, sweeping its suction

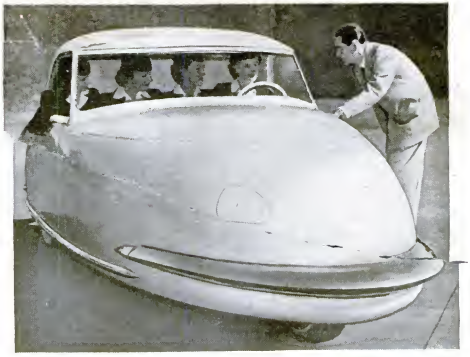
(Continued to page 264)

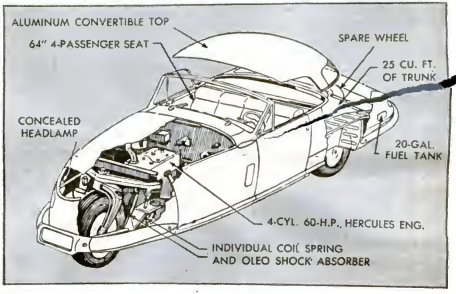


Three-Wheel

Copyright © Wikipedia.pl

Three-Wheel Davis Car





Aircraft principles are incorporated in the design of the three-wheel, four-passenger Davis car. The designer and builder, Gary Davis, contends that if tricycle landing gears are strong enough to withstand the take-offs and landings of heavy passenger planes they should easily support an automobile weighing 1385 pounds. The car is powered by a four-cylinder 60-horsepower Hercules engine and is said to have a top speed of 116 miles an hour. Gasoline consumption, depending on speed, varies from 35 to 50 miles per gallon. The wheelbase is 108 inches and the over-all length from bumper to bumper is 15 feet. Width of the single seat is 64 inches. Aluminum body panels and top are removable, the latter being secured by four toggle bolts which are taken out to convert the coupe into a roadster. The body of the fenderless car is protected by wrap-around spring-steel bumpers. Other features are a 72-inch windshield, three-inch tubular-steel frame, hydraulic brakes, hydraulic shock absorbers and coil-spring suspension. Deluxe models will have built-in hydraulic [illegible] Davis plant at Van Nuys [illegible] production schedule of 50 cars a day and expansion plans to boost production to 1000 cars daily. Designed to compete in the midget-class market the car will sell for about $995 F.O.B. Los Angeles, according to the manufacturer.

"Water Polo"—Fireman's Version

Air Materiel Command photo

Four-Foot Metal Bar Used to Tow Gliders and Jet Fighters

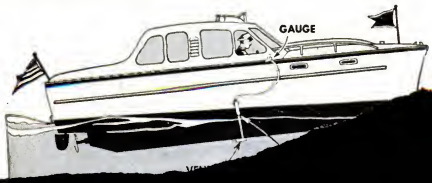
Use of a metal bar instead of rope may make it possible to tow gliders and jet fighters in instrument weather. If tests with P-80s are successful it would mean that they could be towed into combat areas and their own power conserved for actual fighting. Experiments with gliders have already proved satisfactory. The 48-inch bar permits two craft to maintain direct contact and to operate as a unit.

Radioactive Vegetable Seeds Have Larger Yields

Treating vegetable seeds with salts from radioactive elements increases their yield about 10 percent, according to reports by Paul Becquerel, noted French botanist. Peas dipped in a 1 to 10,000 solution of uranium nitrate produced vines that yielded 10 percent more than untreated peas. When a growth-promoting hormone, phenylacetic acid, was added to the solution, the increase amounted to 27.5 percent.

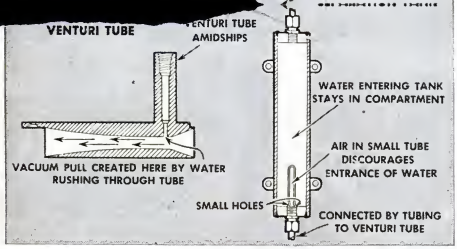
Boat Speedometer Registers Knots and Miles Per Hour

Both knots and miles per hour are registered on a vacuum-type marine speedometer designed for rowboats or battleships. The speedometer is an adaptation of the Venturi-vacuum system in which water rushing through a horizontal tube causes a partial-vacuum pull in a vertical tube. The principle has long been known but has been difficult to apply to boat speedometers because water was pulled by the vacuum into the tube when the boat stopped, and was difficult to eject. In the [illegible] speedometer, a spe- [illegible] tion tank is



Firemen's Version

Firemen at Mebane, N. C., play their own leisure-time brand of "water polo." Each team mans a fire hose and with powerful streams of water they attempt to shove an empty oil drum across their opponent's goal line. Knowing where to aim the water pressure for best results is one of the game's fine points.

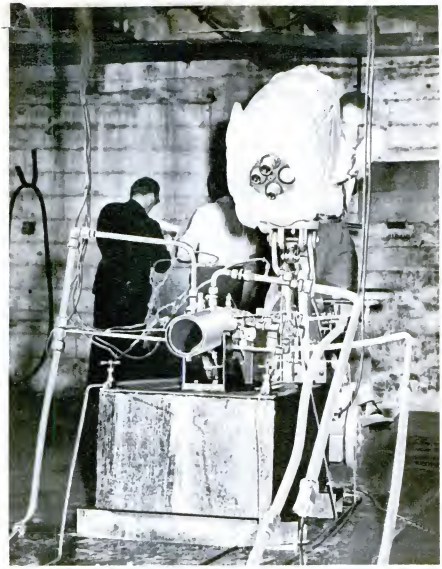


turi tube and water drawn up the tube when the boat stops remains in the separation tank. A tube inside the tank discourages the entrance of water.

Information, including manufacturers' addresses, concerning products described in this issue may be obtained by writing Bureau of Information, Popular Mechanics, 200 E. Ontario St., Chicago 11

Television Eye Focuses on Test Of Rocket Motor

Television was lifted from the entertainment to the scientific field to give observers 700 feet away close-up views of dangerous tests of a high-thrust rocket motor. With the action less than two feet from the lens, the camera's images were relayed by coaxial cables to three screens. The sharply lighted close-up gives engineers opportunity to detect fuel leaks and firing malfunctions which could result in an explosion. It eliminates the need for observation blockhouses, with safety glass and mirrors that cloud from effects of gaseous fumes. The camera is heavily mounted and blanketed with layers of sponge rubber to reduce vibration that would affect transmitted images. It can be run remotely after the focusing. The technique was developed at the Azusa, Calif., testing grounds of the Aerojet Engineering Corporation.



Above, setting up shockproofed television camera behind rocket motor on test block. Below left, placing camera to record readings of control room instruments. Below right, observers 700 feet away watching test

Combining rocket and jet power for the first time, the Skyrocket is expected to approach sound's 761-mile-an-hour speed
Douglas Aircraft photo

NEEDLE-NOSE ROCKET PROBES SONIC SPEED

ROCKET AND JET power team for the first time in the Navy's needle-nose Skyrocket in an attempt to outrace sound. Together they give the tiny plane almost as much driving force as the largest bomber.

With this tremendous power, and embodying the latest discoveries in sonic aircraft design, it is believed capable of more than 700 miles an hour. Sound's speed at sea level is 761 miles per hour.

In a typical run, jet thrust alone will fly the plane above 25,000 feet, before the four-barrel rocket engine goes into action. For a two-minute lunge, while 1½ tons of fuel burns up, pent-up gases will roar from the rocket tubes in an all-out speed effort. When this is exhausted, the jet will take the plane back home. The combined units can deliver the equivalent of approximately 18,000 horsepower.

The Skyrocket differs radically in appearance from its sister Douglas-built ship, the Skystreak, holder of the 650.8-mile-an-hour speed record, and the Bell XS-1. Its stubby wings, only 25 feet from tip to tip, sweep back at a 33-degree angle and the tail at an even sharper 40 degrees. While the XS-1 was solely rocket powered and had to be carried up for tests, the Skyrocket takes off and lands under its own power.

By Aubrey O. Cookman, Jr.

The comparatively thick swept-back wing's effectiveness is increased by being dipped down five degrees, instead of tilting slightly upward. Stall-control vanes, acting as "dams," prevent spanwise air flow and resulting loss of lift.

At low speeds the stalling bugaboo is licked by using Handley-Page automatic slots over the ailerons, maintaining their control to much greater stalling angles. Small braking flaps on the fuselage sides aid in slowing down for landings.

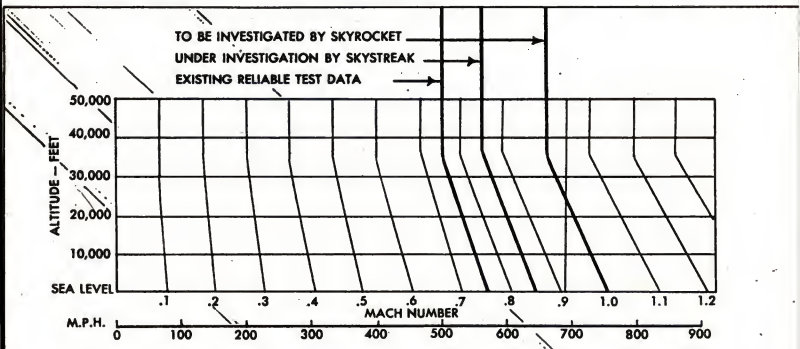
No "bubble" breaks the plane's clean lines. The pressurized cockpit, equipped with oxygen, refrigeration

and heat, is housed completely inside the highly polished fuselage. Keeping the cockpit livable at 760 miles an hour, a task that would tax the cooling facilities of 40 household-size refrigerators, is done by a 16½-pound unit. This combination cooling turbine and air-to-heat exchanger, developed by the AiResearch Company, drops jet-engine air temperature from over 500 degrees Fahrenheit to under 40 at high speeds.

While figures aren't available on the Skyrocket, its predecessor,

Short, swept-back wings and a needle nose mark Navy's new sonic plane

In emergencies, the nose and cockpit are jettisonable, falling free until pilot can safely parachute to earth. Chart shows how much this research ship is expected to increase our knowledge of sonic range



Instruments on nose are to measure plane's yaw and pitch characteristics. The "gill" at right is one of two air intakes for the powerful jet unit

the Skystreak, would have recorded cabin temperatures of 180 degrees during its record-breaking run without such refrigeration. At the rocket-jet's expected pace this would get above 212 degrees, the boiling point of water, and flying personnel would boil like lobsters in a kettle.

In comparison with everyday refrigeration methods, this new principle of air expansion cooling, with its dollar-sized impeller wheel, saves its weight every three minutes of flight. If ice were used, 5½ pounds would melt every minute of flight, faster than is possible in a home oven.

Two air intakes or "gills" that feed the Westinghouse 24-C turbojet are on the lower sides, to the rear of the cockpit. A jet exhaust is on the belly between wing and tail. Since it carries its own oxygen, the liquid-rocket system requires no inlet and the tail cone is removed before flight to open an exhaust vent. About 6000 pounds of thrust comes from the rocket engine, built by Reaction Motors, and approximately 3000 pounds is supplied by the jet.

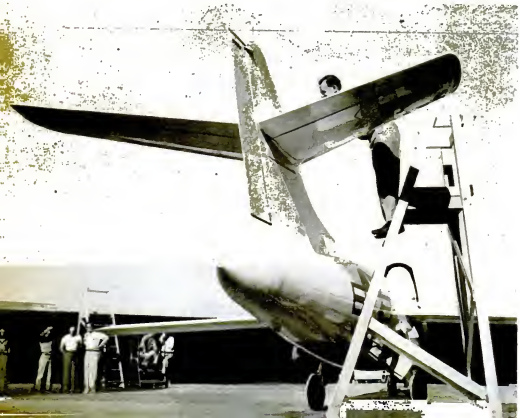
A quick-release emergency device jettisons the pilot's compartment. It falls free until it reaches an altitude and speed where the pilot can parachute safely.

There's no provision for armament, but the Skyrocket carries a payload of equipment to measure air pressure at 400 places on the wing and tail surfaces. In addition, over 900 strain gauges and oscillographs will measure and record forces and stresses on the structure. A photographic flight recorder will keep track of the standard flight instruments.

Most of the fuselage is built of tough magnesium alloy, with wings and tail chiefly of aluminum alloy. The 45-foot-long fuselage is tipped by a needle-like nose, containing a pitot static tube for the air-speed indicator. Gross weight of the plane is close to 15,000 pounds. There is tankage for 250 gallons of aviation gasoline, not kerosene, for the jet engine, in addition to special fuel for the rocket.

The Skyrocket has a memorable birthday—VJ Day in the summer of 1945, at Douglas' El Segundo, Calif., plant. A short time afterward it was decided to shift from a short, straight wing, like the Skystreak's, to research swept-wing prospects.

When rocket power is used, tail cone is removed to provide exhaust vent



Rocket power was included when it was found that even the most powerful jet engines then available wouldn't give the swept-back design a thorough high-speed testing. At another stage thought was given to discarding the jet engine and its 3000 pounds of weight, and using a mother ship to carry it high enough for launching. They finally decided, however, to keep both.

By March of 1946 a mockup was completed and less than 20 months later the finished article was ready. The Skyrocket's official Navy designation is D-558-2.

No More Burned Fingers

There's no chance of burning fingers on boiled eggs when egg tongs are used. Made of stainproof metal, these tongs hold the egg from the time it is taken out of the water until the shell is discarded. Rolling the egg on the table top while still in the tongs breaks the shell neatly around the middle. The egg halves are then separated and the cooked portion of the egg removed from the shell.

Hearing-Aid Selector

Merely by pressing the control button on a hearing-aid selector, the hard-of-hearing person can test as many as 140 different hearing-aid circuits. The deafened person tries the various circuits until he finds the one that does most to eliminate his handicap. During the fitting, it is possible to switch from one circuit to another in the middle of a sentence without changing the earpiece or any external wiring.

Shoe-Shine Delivery Service

Keeping their shoes well-shined is made easy for busy people in Houston, Tex. A speedy delivery service picks up the shoes at the customer's home and returns them the same day gleaming like new. The shine shop polishes hundreds of shoes daily. Free pick-up and delivery by motor scooter are made seven days a week.

One-Man "Yacht" Has Outriggers

Described as a one-man "yacht," a tiny Japanese sailboat weighs only 55 pounds. Two outriggers attached to the stern of the craft prevent it from capsizing. The center section is only 16 inches wide and 5 feet 5 inches long.

NEW METHODS IN OLD MINES

↑ Conveyor belt drops ore in Diesel tractor-trailer fitted with system for making exhaust nonpoisonous

BUT YOU CAN'T operate Diesel trucks underground," the visiting engineer argued. "The carbon monoxide fumes will kill every man in the mine."

The visitor was deep in an Eagle-Picher lead-zinc mine in Oklahoma and had just watched a big Diesel tractor rumble by, towing a 10-ton load of ore.

The mine's superintendent grinned. "Usually that's true," he admitted, "only these trucks don't give off carbon monoxide. There's a constant chemical change in the exhaust pipe, transforming the monoxide to carbon dioxide. We feed pure oxygen into the exhaust from a tank on the truck and the nonpoisonous gases that come out of the pipe are swept away by normal mine ventilation. The drivers and miners work all day in perfect safety."

In European mines where adequate ventilation exists or can be created, air compressors, bulldozers and hundreds of in-

Panel control feeds oxygen from tank under floor into exhaust, converting fumes into carbon dioxide

ternal-combustion locomotives are being operated underground.

Once a pick-and-shovel operation, underground mining is being mechanized to an almost automatic procedure. This is more and more necessary as some of our richest ores become exhausted. That doesn't mean, says the mining industry, that the United States is approaching the status of a "have not" nation in reserves. Temporary shortages in such metals as copper have been due to a high demand plus rising extraction costs, factors that eventually level themselves out.

The fact is that vast amounts of metallic and nonmetallic minerals are still in the ground, in many cases in quantities sufficient for our needs for centuries. Some of these reserves, however, are in the form of low-grade ores that cannot be worked profitably by methods used in the past. More efficient and safer ways of handling the material underground and better ways of concentrating and refining it are being developed.

The exhaust purifier is one innovation in underground transport; another is the use of rubber conveyor belts for moving ore from a working face through the tunnel system and up to the surface. The endless belts follow the configuration of seams, can carry materials around sharp corners, and can boost heavy loads up steep grades to the surface.

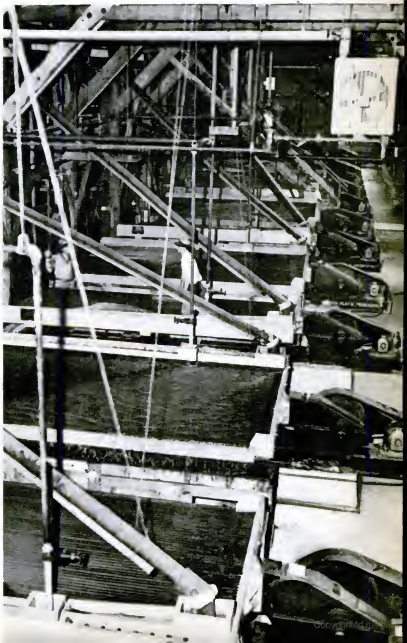
One immense conveyor belt, half a mile long, is being installed by Goodyear Tire & Rubber Company in an Alabama coal mine. It will raise 600 tons of coal per hour to the surface from 715 feet underground, perhaps the greatest climb ever attempted by a conveyor belt.

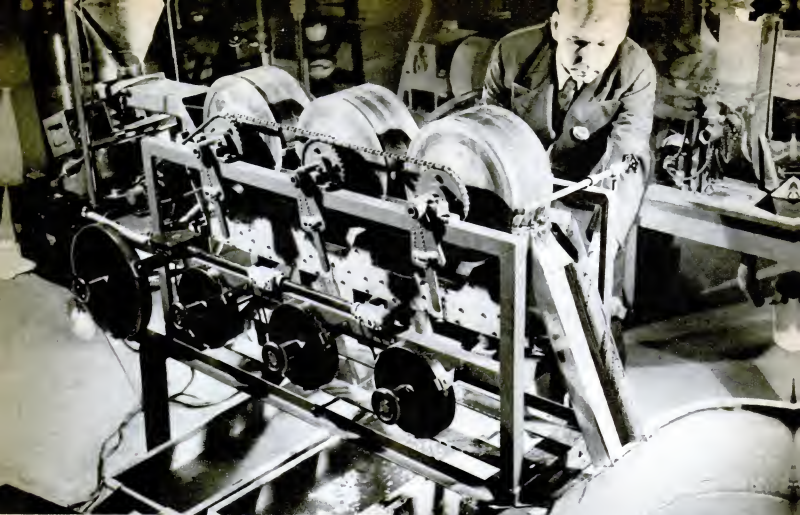
Forty-two inches wide and weighing 42 tons, the belt is reinforced by 330 steel cables in its carcass in place of the usual fabric cords. Two 300-horsepower motors rotate the belt, which will carry its load up a slope of approximately 17 degrees.

Underground air conditioning is receiving considerable study as a safety measure in gaseous or dusty mines and for greater comfort. In some deep mines without air conditioning, the constant temperature stands at 100 degrees or higher. Telephones are replacing pipe-rapping and other makeshift signaling methods and in some mines electric eyes sound horns at tunnel intersections to warn of the approach of ore trains.

Tungsten-carbide points on rock drills are being adopted because they permit faster drilling with fewer bit changes. Mine timbers can be set by a new machine that does the work of a gang of men, and push-button elevators in some of the mines are saving travel time as well as eliminating

↑ Gold concentrates are tipped into a fuel-oil furnace for melting into bullion. Below, huge "tables" wash impurities from iron ore in a reopened mine





Battelle Memorial Institute photo

↑ Engineer checks wet magnetic separator, which isolates valuable iron oxide from iron ore by magnetism

← With a strainer, worker tests fineness of pulverized rock mixed with water flowing from a ball mill

practically all ladder climbing. In open-cut operation on the surface, massive pieces of equipment that take bigger bites or handle bigger loads than ever are in use.

An electric cable that won't spark when short-circuited may help prevent coal-mine explosions. A fine-strand of copper wire between two layers of insulation catches any current "leaks" before an arc can occur. The wire carries current to a circuit breaker which cuts off the power.

The flotation process that gleans the valuable ingredients from a wide range of ores has been improved and extended. New chemicals have been added for floating minerals, other chemicals that assist in depressing unwanted materials have been found, and wetting agents such as Aerosol are being employed to increase the efficiency of the operation.

A development hailed as one of the most important since flotation came into use is the recent adaptation to big-scale operations of the "sink float" concentrating process, which is a method formerly used only in the laboratory.

Sink-float process automatically sorts the useless and lowest grade materials from an ore, leaving a concentrate that can be milled at minimum expense.

When coarse preliminary crushing of an ore and the sink-float separation are performed underground, as is contemplated, the cost of hoisting tons of useless material to the surface, transporting it to the mill, and running it through the mill will be avoided entirely.

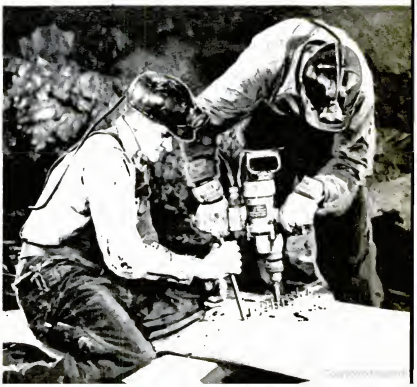
The sink-float process consists of passing an ore through a bath composed of a heavy

(Continued to page 244)

MAGNETIC SEPARATOR
UNCLEANED MEDIUM
CLEANED MEDIUM
TO WASTE
MEDIUM DENSIFIER
WASHING SCREEN
WATER SPRAY
CONE DRIVE
DEMAGNETIZING COIL
DENSIFIED MEDIUM
FLOAT
WASHING SCREEN
WATER SPRAY
SINK
WATER SPRAY
CONE SINK PRODUCT
DRAINAGE AND WASHING SCREENS
SEPARATING CONE
CONE FLOAT PRODUCT
REVOLVING SWEEP
PUMPS
CRUSHED ORE
MAGNETIZING BLOCKS
AIR LIFT
HIGH-PRESSURE AIR INLET
ELEVATOR
THICKENER

HEAVY-MEDIA SEPARATION PLANT

In American Cyanamid's Heavy-Media process, ore is hoisted into cone containing heavy liquid. Concentrate floats off top, waste sinks, or vice versa. Material in suspension is recovered by magnetism. Below left, ore and waste move across parallel washing screens. Right, section is added to the conveyor belt as tunnel grows



Stand-By Engine Has Robot Controls

Rebuilt from a 1910 locomotive, a new steam switcher that burns coal has many of the quick-operating advantages of switchers burning other types of fuel. The locomotive, rebuilt by the Norfolk & Western Railway, has automatic stand-by mechanisms which keep it ready for service even after it has been left unattended for several hours. Automatic controls maintain the pressure in the boiler and fix the ratio of air and coal. A stoker has been added and the front end of the locomotive extended for a fan which provides an induced draft. Separate stacks discharge the combustion gases and cylinder exhaust. In addition to its quick availability, the switcher is more economical to operate.

Top left, 1910 engine before conversion to the sleek "round the clock" switcher shown above. Inset shows panel which includes switch to actuate robot controls, a fuel-air ratio control and steam-pressure control

Caddy Cart Measures Drives

Golfers can check the length of their drives with a new caddy cart that has a meter on one wheel. Each turn of the wheel is recorded, with the distance computed in yards on the meter. The caddy cart has wide-tread wheels, and only one strap secures a golf bag.

Battlewagon Decks of Pressed Wood

For nearly half a century the decks of ships of the U. S. Navy have been made of imported lumber, but a composition made of American woods has been developed that will make the Navy independent of foreign wood. Burma teakwood has long been considered ideal for battleship decks because of its strength and durability. Teakwood's new rival is a combination of American woods, treated with resins and compressed. One type is made of redwood and cottonwood, another of basswood and hard maple. The new product, developed by the Navy and the U. S. Forest Products Laboratory, was installed on the landing deck of a giant carrier and has withstood 18,000 airplane landings.

T[illegible]od

Chil[illegible]cles are preven[illegible]ash-ing into t[illegible]ic or otherwise endangering themselves by a remote-control rod attached to the rear of the cycle. The British tricycle also has a compartment between the rear wheels for mother's groceries. The jointed rod folds for storage.

Periscope Camera

Clipped over the eyepiece of a submarine periscope, a camera developed by Eastman Kodak takes pictures at the rate of one per second. Designed for photographing shore lines before invasions, the camera can be loaded with a film that is developed in daylight in one minute. For strip pictures of long areas, the camera uses aerial film.

Telescoping Lift Truck

Fully extended, a new hydraulic lift truck raises 4000 pounds to a height of 11 feet, but it can be lowered to an over-all height of only six feet. This telescoping feature permits use in freight cars and cramped places. The sloping front provides excellent visibility, enabling the driver to see the load to be picked up. Scoops, forks and other attachments are available for handling a variety of heavy or bulky materials.

Bureau of Mines Seeks Way To Ship Lignite Safely

If the Bureau of Mines can find a safe way to ship lignite long distances, this country's usable fuel reserve will be increased 30 percent. Lignite, commonly called brown coal, can't be shipped many miles because it ignites when dried in air. Most U. S. deposits are in the Dakotas and Montana. The bureau's research staff hopes to find a way to ship the fuel to eastern industrial areas.

Builder Howard Hughes at the controls of his giant flying boat. This compartment alone is larger than an ordinary living room. Floor is 28 feet above water

Above, in a surprise move during taxiing tests, plane was first flown about 70 feet over water for a mile

200 TONS-- AND IT FLIES!

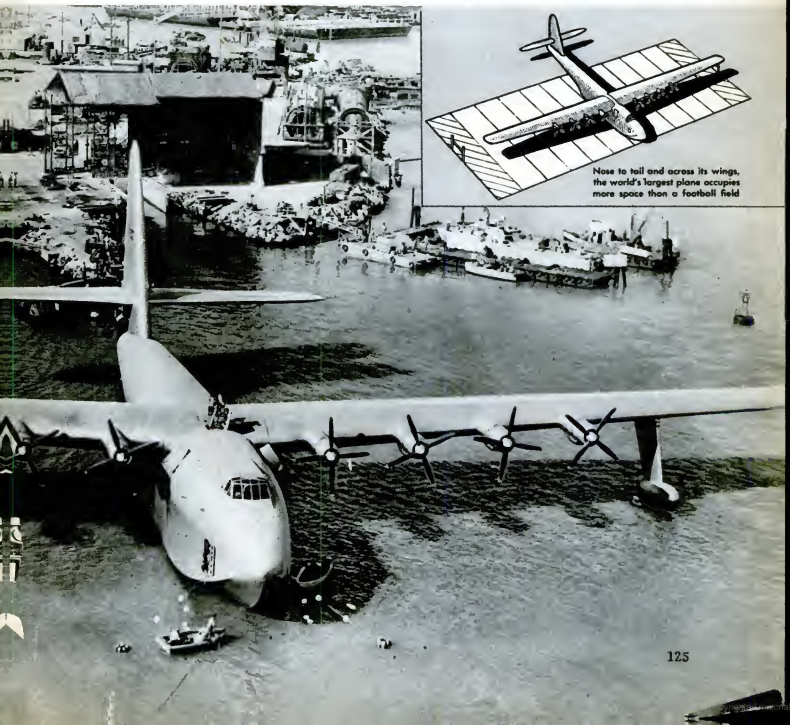
PUT WINGS on Noah's Ark and you have some conception of Howard Hughes' fabulous plywood flying boat. Weighing 200 tons and capable of carrying 700 troops, approximately the number in a battalion, it is by far the largest plane that has ever flown. It cost $25,000,000 to build.

The most amazing thing about the colossus is that it flies. Only Hughes and a handful of loyal followers believed that a few years ago.

If you can imagine a 32-story building, stretched out on its side and flying, you'll appreciate how onlookers at Long Beach, Calif., harbor felt when this Gargantua of the skies first rose from the water. That size comparison is equivalent to the 320-foot wing span. Length from the nose to the

	Wing Span	Length	Weight
Hughes Flying Boat	320 ft.	219 ft.	200 tons
B-36 (largest bomber)	230 ft.	163 ft.	139 tons
DC-6 (52-passenger air liner)	117½ ft.	100½ ft.	46 tons

Below, boats and even the drydock in the background are dwarfed by the monstrous plane. Its 320-foot wing span is more than three times that of the wartime Flying Fortresses and it weighs six times as much



Nose to tail and across its wings, the world's largest plane occupies more space than a football field

Tail being installed, above, is 52 feet high. Below, Hughes with flight engineer and radio man in forward part of flight deck. All their stations are on the upper level of the 219-foot hull

tip of the tail measures 219 feet.

Describing the plane requires liberal use of superlatives. Its thin rudder towers 80 feet above the keel and the wings are about 11 feet thick at their roots. Fully loaded, it draws eight feet of water. Pilot and copilot are 28 feet above the waterline in a compartment larger than an ordinary living room. Its normal operating crew will be about 15 men.

Eight 3000-horsepower engines give it a total of 24,000 horsepower, double that of any other aircraft. After initial take-off, when it left the water at about 80 miles an hour, Hughes said he used only 2200 horsepower on each in taxiing and 1200 in the air. Fuel capacity is 14,000 gallons, enough for several thousand miles of flying.

Nothing now in the air or under construction even approaches it in size. Britain's Brabazon, scheduled for service as a 120-passenger air liner, is only 126 tons; from nose to tail it stretches 177 feet, with a wing span of 230 feet. Consolidated's XC-99 transport, tipping the scales at 139 tons, is expected to carry 50-ton loads. It has the same wing span as the Brabazon and is 182½ feet long.

Though scoffers labeled it the "Spruce Goose" and the "Flying

Getting ready to tow NX37602 to deep water after flooding its drydock. Housing at rear sheltered the tail

Lumberyard," there's been no name officially selected for the plane. Hughes prefers not to follow the usual practice of giving it a popular trade name. The government designation is NX37602.

Many problems were licked in converting it from a drawing board dream to something that actually flew. For the first time on any airplane, the control surfaces are so large that no man in the world can operate them. The customary steel cables from the pilot's rudder pedals and control wheels to the tail and wing tips were useless, yet their job had to be done.

As a result, a sensitive power-operated control system, providing 26,000 pounds of pressure and as reliable as the structure of the plane itself, had to be devised. Engine failures, even all eight, would permit a forced landing. But if the controls failed, a crash, death and destruction were inevitable.

Since the plane was begun in 1943, when the metal shortage was still acute, engineers had to use laminated wood, with each thin sheet carefully inspected before gluing, to form the heavy sections. Solid beams weren't acceptable because there was no way to examine them inside to detect possible weaknesses and semi-rot. In the gluing, very high-frequency electrical current was used in applying high pressures and temperatures

Inboard engines are started first. Warming up all eight takes full half hour

General view of cargo compartment. Plastic balloons in foreground are portion of 2500 carried along on test flights as emergency buoyancy

Above, flight engineer's panel where check is kept on eight 3000-horsepower engines. Below, horizontal stabilizer at the tail spans 113½ feet, wider than the entire wing of wartime bombers like the B-17 and B-24

uniformly to the heavy laminated members.

Sheer size was another problem. Where previous planes had been 10 to 50 percent larger than their predecessors, at the time of design Hughes' plane was three times bigger than anything ever attempted. There were no comparisons available in construction or in flight problems to be encountered.

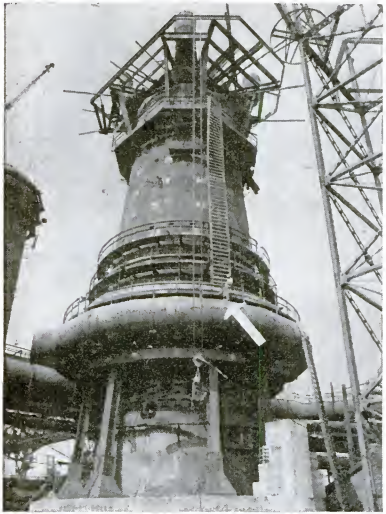
Moving huge sections of the plane 35 miles to the harbor for assembly was an engineering feat in itself. It was accomplished for less than $100,000, well under the cost of erecting another plant near the water.

No major flights are planned for the big boat until March or April. Until then there'll be only brief, cautious trials close to the water, "feeling out" the craft's handling qualities. Questions that once existed only on paper will begin to get answers in the air.

The giant's assignment will likely remain undecided until Hughes completes tests and turns it over to the government, its owner. But, regardless of its final role, the NX-37602 is slated to be for many years the biggest plane that ever flew!

"Pop Bottle" Racers Hit 131 M.P.H.

Midget racing cars zoom down a copper wire, starting from a dead stop to hit 131 miles an hour within one second at the Pittsburgh plant of the Westinghouse Corporation. The little racers, often weighing less than a quarter of an ounce, are powered by the carbon-dioxide cartridges used in home siphon bottles. Engineers started building the midgets, which they call "pop bottle" racers, as a hobby. The "track" is the 160-foot-long corridor of an office building. Attached to the copper wire by an agate fish-pole guide, the racers are timed electronically. At the end of the course they crash into a pile of rags. Made of steel, aluminum and balsa wood, they are little more than containers to hold the cylinder. They are started by inserting the rear of the cartridge in a block of wood and puncturing it with a phonograph needle.



Protruding "Bustle" Pipe Encircles Blast Furnace

Under construction in U. S. Steel's South Chicago Works is a giant blast furnace encircled by a huge pipe which will carry a blast of hot air to the furnace at a rate of 90,000 cubic feet per minute. A blast furnace is known to the steel industry as a "lady" so workmen are calling the protruding pipe her "bustle." The furnace, which is one of the largest in the world, is one of three such blast furnaces built in the Chicago area since the end of the war. Workman, indicated by the arrow, is dwarfed by the huge pipe.

Vapor Unit Peps Up Engine

By dampening the gas-air mixture after it goes through the carburetor, a compact vapor-power unit improves engine performance for trucks and automobiles. According to the manufacturer, the device provides increased horsepower, eliminates motor "ping" and reduces carbon deposits. The unit is easy to install in an engine.

DIGGING INTO MEXICO'S

Covering more than 12 acres, the Pyramid of the Sun at Teotihuacan attracts thousands of tourists annually

By Andrew Hamilton

IN THE National Museum in Mexico City are several life-sized stone figures called Chac Mools. They lie on their backs with bowls resting on their stomachs. These reclining statues are supposed to have been Mayan altar decorations and the bowls once held incense, blood or other offerings.

According to rumor, an archeologist went mad trying to explain more than this. He was found in the museum, whispering into a Chac Mool's stony ear.

Whether or not the tale is true, it illustrates a point: there is so much of archeological and anthropological interest in Mexico that a man might well go crazy trying to put all the pieces together.

Mexico is a huge outdoor museum and the shovel-wielding scholars who dig into its history have hardly scraped its sur-

PAST

face. A score of archeological sites have been worked, but hundreds more remain untouched beneath plowed fields, creeping tropical jungle or the paved streets of modern cities. Nine feet below Mexico City, for example, are the remains of the ancient Aztec capital of Tenochtitlan. These ruins probably never will be investigated because it means digging up the center of Mexico City.

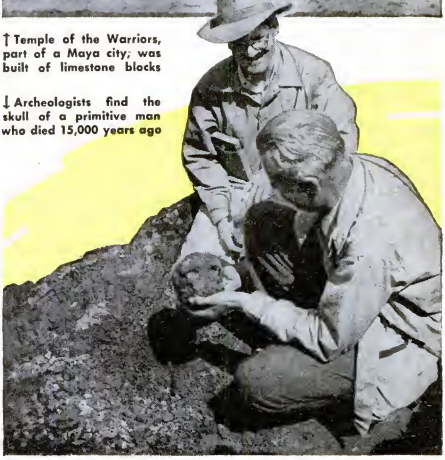
So important is archeology to Mexico that a National Institute of Anthropology and History supervises all excavation projects. Staffed by some of Mexico's ablest archeologists, it is financed by government grants of 2,500,000 pesos a year.

Before the Institute was created in 1896, foreign expeditions (including some from the United States) worked Mexico's ruins, crated the findings and shipped them out of the country. The loot included rare gold and silver objects, stone carvings and even an entire pyramid in one instance.

Mexico finally realized that she was being stripped of valuable historical objects and put a stop to this practice with a law that makes all archeological treasures the property of the nation.

Today, several American expeditions, including those from the University of California, the University of New Mexico, the Carnegie Institution, the National Museum of History, the American Viking Fund and others, are working with Mexican archeologists—not to rob Mexico of her ancient, pre-Spanish art objects,

↑ Temple of the Warriors, part of a Maya city; was built of limestone blocks



↓ Archeologists find the skull of a primitive man who died 15,000 years ago

↑ A life-size stone statue, called a Chac Mool, is thought to have been an ancient altar piece.
← Potentiometer detects location of buried ruins

but to help reconstruct the fascinating story of North America.

Mexico has become the archeological "hot spot" of the world. The great civilizations of Egypt, Greece, Babylon and the Malay peninsula have been pretty thoroughly investigated and now the spotlight is on Mexico.

Seven major archeological sites have been uncovered so far: Teotihuacan and Tula near Mexico City; Mitla, Monte Alban and Palenque in the Isthmus of Tehuantepec region; Chichen Itza and Uxmal in Yucatan.

Teotihuacan, 30 miles north of Mexico City, is the location of the well-known Pyramids of the Sun and

↓ Although smaller than some in Egypt, the Pyramid of the Sun towers 216 feet above the plateau near Mexico City. Unlike the Egyptian pyramids, it has a flat top

Moon. To date, only 500 acres of an area covering four square miles have been excavated.

Tula, 50 miles north of Mexico City, was a legendary capital of an ancient people celebrated in song and history. Many stone idols have been uncovered here. Today, it is the scene of some of the most significant excavations in Mexico.

Monte Alban, near Oaxaca, 300 miles south of Mexico City, features temples and pyramids facing a great court called the Temple of the Sun. Some of its tombs have yielded gold and silver objects and precious stones.

Mitla, not far from Monte Alban, was known as the "Place of the Dead." Its tombs and temples were supposed to be a resting place for spirits who returned to the earth after death.

Palenque, located a few miles inland from the lower bend of the Gulf of Mexico, was once a sacred city. Ancient American civilization is said to have reached its highest peak in this region.

Chichen Itza, perhaps the best-known ruin in Mexico so far as the American public is concerned, is an example of the Maya civilization. Excavations have been carried on in this Yucatan city for years by the Carnegie Institution and the Mexican government. Two miles of buildings have been uncovered, but others still remain.

Uxmal, which means "three times destroyed," is another Mayan site in Yucatan. Its temples and palaces, now overrun by jungle, still hold important archeological secrets.

What do archeologists expect to find as they peel back the layers of dirt and time?

First, they hope to solve the riddle of the origin of the North American Indian. At present, it is generally believed that he migrated from the other side of the Pacific. A few Australian natives made their way to the Tierra del Fuego country at the tip of South America; a few Polynesian islanders in their canoes reached the shores of both North and South America; and a few Chinese junks may have been swept by the Japanese current to western Canadian shores. But the

↑ Archeologist examines a stone head found at Tula, a city celebrated in song and legend as the capital of an ancient people

↓ Uncovering the "Serpent's Walk" at Tenyuca, near Mexico City

↑ Broken stone idol as it appeared when uncovered at Calixtlahuaca in the Toluca Valley. Left, the idol as it looks after restoration. ↓ Steps leading to the top of a small pyramid-temple at Teopanzolco

heaviest migration, archeologists believe, came across the Bering Strait from Siberia. A land bridge existed there before the last glacial epoch (about 15,000 years ago) and early ancestors of the American Indian poured down into the Americas.

Hair, skin and blood types of present-day Mexican Indians resemble those of Asiatic peoples. Visitors to Mexico are startled by native faces which often resemble those of the Chinese or Japanese. There is, however, one difference: the Mexicans do not have the folded upper eyelid which gives a slant-eyed effect. But then, neither do all Asiatics. It is believed that the ancestors of present-day American Indians were nonslant-eyed natives of Siberia.

Archeologists are excited over a discovery that sheds additional light on the origin of the American Indian. Near Mexico City a long, narrow skull with heavy eyebrow ridges was found recently. Although modern in shape, this old skull suggests a primitive type such as the Peking Man or the Neanderthal Man. However, it is not as old as either of these, being but a comparative youngster—10,000 to 15,000 years old.

This earliest American apparently met his death while on an elephant hunt. His skull and a few other bones were found about three feet below the surface of the earth near a great quantity of mammoth bones, tusk and teeth in an area that earlier had produced obsidian arrowheads.

Second, the archeological ruins of Mexico are expected to present a more complete picture of what these ancient Amer-

ican civilizations were like. What kinds of houses the people lived in, how they dressed, what they ate, how they were governed, and what their religions were.

European archeologists once scoffed at the ancient peoples of Mexico. But evidence has piled up to prove that the Mayas, the Toltecs, the Aztecs, the Mixtecs, the Zapotecs and other races built a colorful and complex civilization before the invasion by the Spaniards about 1520. The "Golden Age" of their history was from the time of Christ to 1200 A. D.

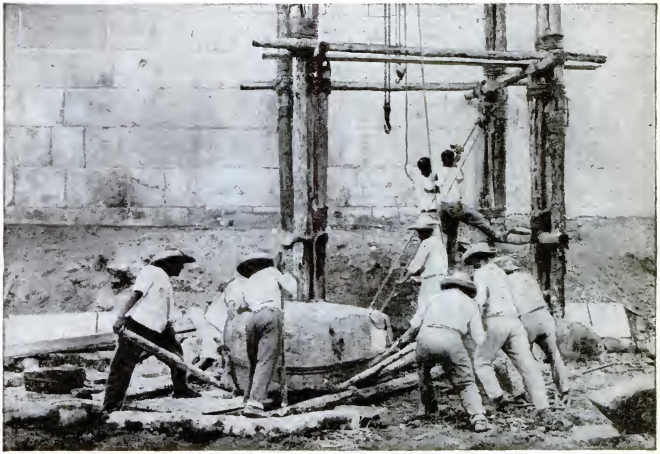
During this Golden Age they constructed pyramids, erected ornate temples and palaces and built irrigation systems. They knew some of the mysteries of astronomy and mathematics and cultivated many foods that we eat today: corn, beans, squash, avocados, yams and chocolate. They were aware of some uses for rubber and devised a game similar to basketball. It was played on a court and consisted of tossing a rubber ball through a stone hoop.

But they went down before the Spaniards because tribal wars had weakened their organization, because they had not developed

(Continued to page 236)

↑ Tourist admires a complex design at the Xochicalco pyramid

↓ At Chichen Itza, workers slide a heavy stone block beneath the hoist before restoring it to its place in the temple wall



Britain's First Weather Ship

With a bright yellow funnel and superstructure making it easily recognizable, Britain's first weather ship has joined the 13-station network spanning the North Atlantic. The internationally sponsored fleet makes and transmits weather observations for surface and air craft, as well as aiding in search and rescue missions. Ten nations are maintaining it. The Weather Observer, a 200-foot former corvette, will stay within a half mile of its assigned ocean position for 21-day stretches, alternating with another ship. It has aboard the latest meteorological and navigation equipment, along with two motor lifeboats, scrambling nets and rubber dinghies for rescue work. Each of the 26 ships in the fleet carries three meteorologists and four observers in its 52-man complement.

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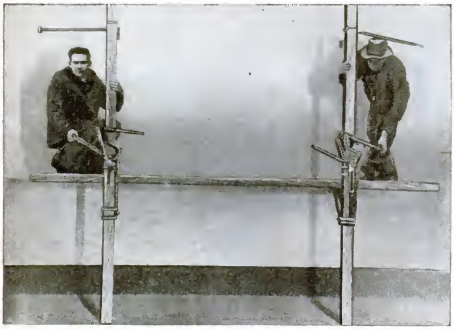
For 21-day stretches the Weather Observer, upper right, will stay at assigned station in the North Atlantic, compiling and sending meteorological reports. Radar, upper left and below, scans for storm clouds and keeps check in upper air



Speed-Up Scaffold

Requiring no ropes, hooks or nails, a new method for securing scaffolding makes it possible to scaffold one side of a 60-foot building in 25 minutes. The scaffold is held to the beams by means of pumps employing three grips. This gives triple safety as any one grip is sufficient to hold the scaffold under normal weight. The pumps accommodate a 24-inch painter's scaffold and can be adjusted to 15 or 18-inch scaffolds.

Electric Knife Sharpener

Because it sharpens only one side of the blade, an electric knife sharpener removes a minimum amount of metal and thus makes knives last longer. Inserted in a slot at the front of the machine, the blade is held at the proper angle. According to the manufacturer, the sharpener does not scratch or mar the blade.

Mask Trips Pilot Ejector

By pulling a heavy cloth mask down over his face, a pilot sets off an ejection device that throws him and his seat clear of the plane. The shield protects his face from the sudden impact of air. After a short interval, the seat drops away, automatically opening the pilot's parachute. At Chalgrove Airfield, England, a pilot was thrown safely from a plane going over 500 miles an hour.

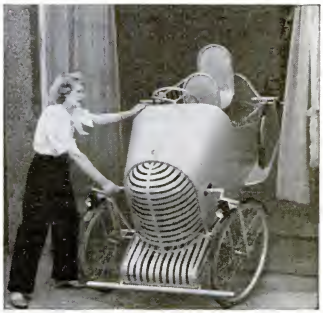
E. A. Wooler
Willow Bungalow
West End Road
South Ruislips
Middlesex England

Cigarette Lighter Worn on Wrist

Resembling a wrist watch, a cigarette lighter manufactured by an English concern straps to the wrist. When the cover is flicked back, the lighter automatically throws out a flame.

Pedal Car Is Kept in House

Having no garage in which to keep an ordinary-sized automobile, an Englishman living at Eastcote, Middlesex, decided to build a small pedal car that could be kept in his home. This economical car transports the family at low cost and saves buying an expensive English road license. It is light enough to be carried down steps.



Still in use, this 26-inch refractor at the Naval Observatory was acquired by the government in 1873

By John L. Kent

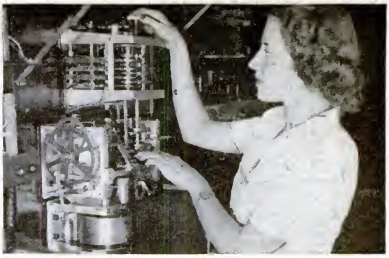
SETTING YOUR WATCH by radio time signals is an easy operation. We have become so accustomed to having this convenient check on our timepieces that we're apt to accept it as something automatic and without effort.

But that is far from the truth. Time signals are based on observations of the stars and the U. S. Naval Observatory in Washington has a complicated set-up that assures exact time for this country and other places in the world. From the observatory, time signals—accurate to 1/100th of a second—are relayed by radio and telegraph to control clocks throughout the country and to ships at sea.

If Father Time had an earthly counterpart, he would probably be Paul Sollenberger, chief of the Time Service at the Washington observatory. No matter what time zone you live in, the time used by your broadcasting station, airport and railroad station comes from Sollenberger's master transmitter clock. This clock is kept accurate by daily observations of the stars.

The correct time was not always as accessible as it is today. There was a time, not long before the beginning of the present century, when clocks were checked at noon each day by the dropping of large time balls mounted atop high buildings. Naval Observatory time signals, first sent out by telegraph in 1865, were used to drop the time ball on the old Western Union Building in New York. Before leaving the harbor, mariners checked their chronometers at noon by the dropping of this ball. Since then, the observatory time signals have become the standard for clocks all over the country. The accepted basis of time measurement is the earth's rotation on its axis, causing the sun and stars to appear to cross the sky from east to west. If the interval between two successive passages overhead of the sun or a star is measured, the time of rotation of the earth is obtained.

To reduce the possibility of human error, a specialized telescope, known as a photographic zenith tube, is used. It "shoots"



Above, operator adjusts the mechanism of the master crystal clock that sends out radio time signals from Washington

Left, front panel of the master clock from which all time signals originate

Right, Western Union subscriber's self-winding clock. Cutaway shows device that synchronizes it with master clock

only those stars that cross the meridian within one-sixth of a degree of the zenith.

The zenith tube is an upright metal pipe, open at the top but closed at the bottom. The lower end of the tube is filled with mercury. Light from a star passes through a lens at the upper end of the instrument, continues down through the tube, is reflected from the mercury surface, and comes to focus on a sheet of photographic film located just under the lens.

A synchronized electric motor drives a rotary film holder that permits the taking of about a dozen photographs of each star in quick succession.

As each star is being photographed by the zenith tube, a chronograph automatically records electric signals produced by the movement of the film carriage in the telescope and also signals produced by the ticking of one of the standard clocks attached to the tube mechanism. Thus, the clock time of the star's transit is determined within a fraction of a second. By comparing these clock times with the known times of star transit computed beforehand, the clock error is determined.

Several standard clocks are constantly corrected in this way. A master transmitting clock is in turn corrected from these standard clocks.

The master clock is of the quartz-crystal type, the crystal serving the same purpose as a pendulum. The frequency of oscillation, however, is usually from 50,000 to 100,000 per second, many times that of an ordinary clock pendulum.

Below, although seldom off more than one second in 24 hours, Western Union's master clock is checked regularly over direct wire to the Naval Observatory. Here, operator receives a time signal via telephone

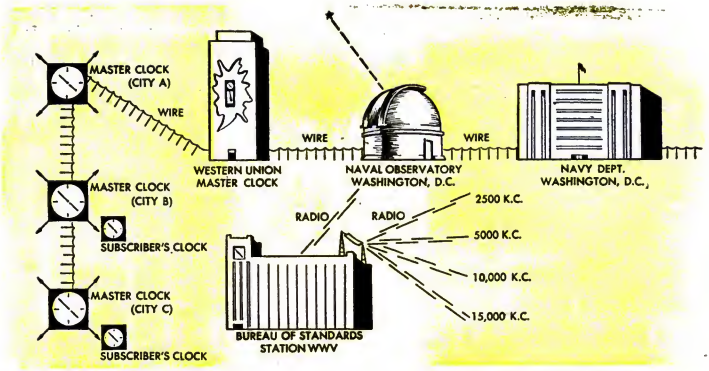


Diagram illustrates how time signals, taken from stars above observatory, are transmitted by wire and radio

Since the crystal clock is affected by the temperature, pressure and humidity of the air around the quartz plate, these are controlled by sealing the plate in a glass or metal enclosure.

The Naval Observatory supplies the Bureau of Standards with the correct time, but the Bureau has its own equipment and crystal clock for broadcasting time intervals. This crystal clock furnishes the only continuous time-signal service provided by any country. Unlike the signals sent by naval radio stations which can be heard only on receivers suited to code reception, the Bureau of Standards signals may be heard on an ordinary short-wave receiver. They are broadcast continuously on carrier frequencies of 2500, 5000, 10,000 and 15,000 kilocycles.

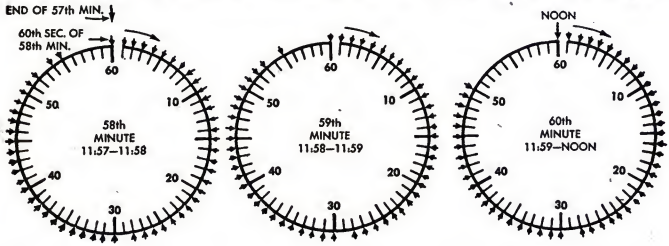
Time signals transmitted from Station NSS, the Naval Radio Station at Annapolis, Md., are controlled directly from the observatory. Other naval stations transmit signals based on the observatory's code.

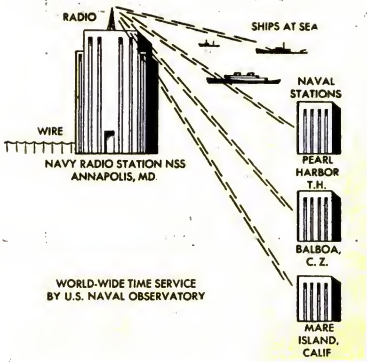
The observatory has no special agreement with any telegraph company, but furnishes time signals free to all firms and individuals who provide wires for the purpose. A radio station may tune in on the time signals and rebroadcast them.

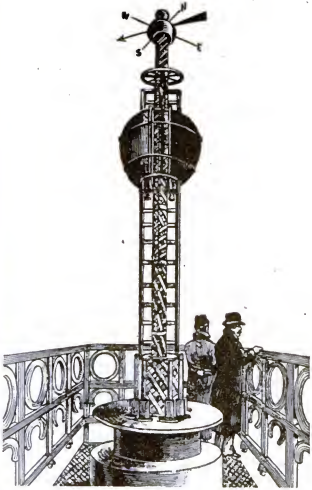
Western Union has a direct wire connection with the observatory and transmits time signals for a period of three minutes before noon, Eastern Standard Time, each day to its offices throughout the country. These time beats use the observatory's code, which omits a beat at the 29th second and follows an identifying pattern during the last ten seconds of each minute.

(Continued to page 232)

Transmitted for three minutes before noon every day, the Naval Observatory time signals are given a varied pattern to indicate the minute. During the final 10 seconds of each minute, certain beats are omitted as shown in the diagram. A 10-second pause precedes the noon beat. The 29th second is silent in all signals

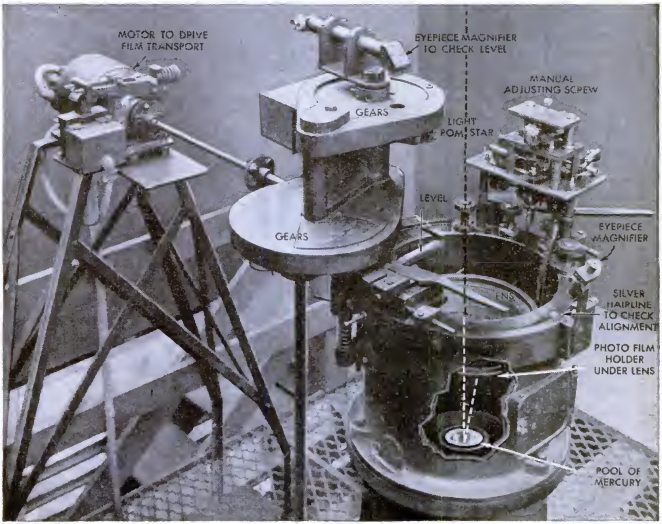






Right, prior to 1890, New Yorkers set their watches when this time ball atop the Western Union Building was dropped at noon by signal from the observatory

Below, by recording the time required for a star to pass overhead, the photographic zenith tube provides an accurate check on the observatory's master clock



Rohm and Haas Co. photo

PLASTIC TOP FOR CONVERTIBLES IS TRANSPARENT

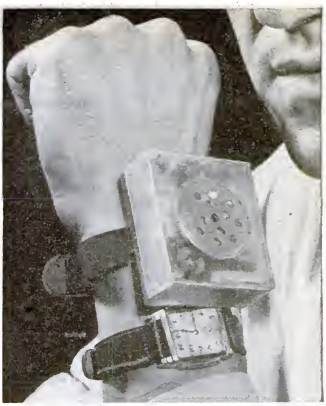
Completely transparent, a Plexiglas top for convertibles gives the occupants unobstructed view on all sides. Available in colors to harmonize or contrast with the body, the easily cleaned top is installed in 15 minutes and fastens to the body at five points. Car windows fit into rubber channels to make a tight seal against wind and rain. The tops are available in tints that admit or exclude burning rays of the sun.

"Spray-Gun" Jeep Pumps Bug-Killing Fog Through Buildings

Insects of all kinds are killed by a fog dispersed through houses with an applicator small enough to be hauled on a jeep. The end of the applicator tube is placed in an open doorway and the fog, consisting of a mixture of DDT, pyrethrin, chlordane and kerosene, is pumped into the house for 20 minutes. Windows and doors are left closed for 1½ hours to enable the fog to penetrate all cracks and crevices. The treatment is said to be effective against the most common insects.

Dried Almond Hulls Used to Make Syrup

Table syrup is made from dried almond hulls, which are 25 percent sugar, by a process worked out at the University of California. Experiments show that 100 gallons of syrup can be made from a ton of the hulls. Beet-sugar factories may be used during off-seasons to make the syrup.



Detector "Hears" Leaking Water And Locates Break in Pipe Line

Leaks in pipes carrying liquids under pressure are located quickly with a midget detector. Operated by batteries, this lightweight detector amplifies the sound of leaking liquid so it is heard in the earphones. The contact tip is held against the pipe and the sound increases in volume as the tip is moved toward the leak. An extension tip is used for pipes that are difficult to reach. Underground leaks are detected by pushing the extension tip into the earth above the pipe.

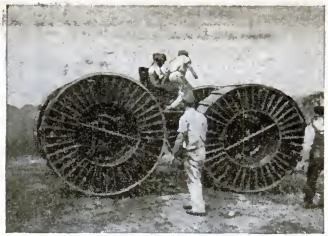
Midget Radio Worn on Wrist Sends and Receives Broadcasts

Now in the process of development, a miniature radio is designed to be worn on the wrist. Equipped with a tiny tube, the set has no wiring and contains instead a stencil coated with silver chloride. Holding up development is the problem of finding a battery small and powerful enough for the set. When the power supply problem is solved, the wrist radio will send and receive short-wave broadcasts in addition to receiving standard broadcasts. It is being tested at the U. S. Bureau of Standards.

Movie Close-Ups Shot From Helicopter

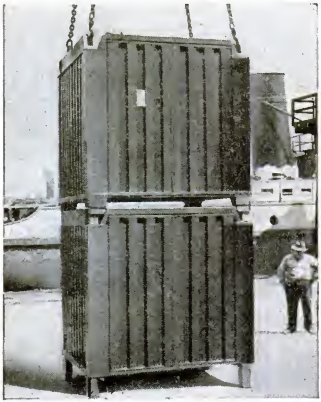
Aiding movie realism, a cameraman edged close to his subjects in a helicopter as they paused after a long run "alone through deserted fields." The helicopter was used for shooting other scenes in "Your Red Wagon" that would otherwise have been impossible.

Names and addresses of manufacturers of new products featured in this issue will be supplied promptly by the Bureau of Information, Popular Mechanics Magazine, 200 East Ontario St., Chicago 11



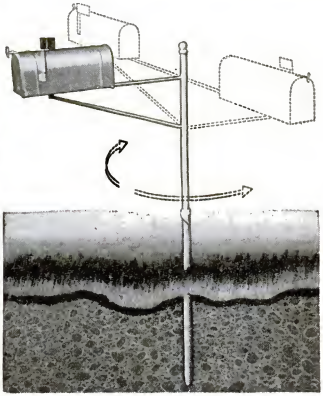
Telephone Cable Spools Are "Shoes" for Canal Craft

Telephone cable spools made watertight are the "shoes" on which spraying outfits can either drive or float in Florida's plant-choked canals. They were devised by the Everglades Drainage District for the campaign to curb growth of water hyacinths.



Interlocking Cargo Containers

Steel shipping containers with legs that fit roof recesses of another save cargo handling time and minimize theft. Lightly packaged merchandise can be packed in the 277-cubic-foot interior and locked for shipment. Lugs in the roof's four corners facilitate crane handling and the legs give sufficient clearance underneath for the use of fork trucks. Weathertight so they can remain in the open during transit, the containers weigh 1650 pounds empty and are 7 feet 9 inches long, 6 feet 5 inches wide and 6 feet 10½ inches high. They carry loads up to 12,000 pounds and can be unloaded four or five times faster than loose tonnage.



Merry-Go-Round Mailbox

Revolving on a spiral cam, a rural mailbox swings out of the way when hit by a truck, tractor or snowplow and then returns to its normal position. The mailbox is supported by two lengths of steel pipe. The lower section is driven three feet into the ground and the upper section fits inside it, resting on the cam which permits the mailbox to revolve but always returns it to the proper position. The box can be adjusted in height from three feet to five feet six inches. The horizontal arm which holds the box is three feet long, permitting the vertical support to be set three feet from the edge of the road. Another model of the box is made for suburban use.

THERE'S MONEY IN HONEY

By James I. Hambleton

Apiculturist, Department of Agriculture

A CARPENTER in Los Angeles took up beekeeping several years ago as a way to earn extra money in his spare time. He soon found that he could quit his job and devote full time to beekeeping. Since then he has purchased a home and put two children through college.

In Wisconsin a farm youth obtained his father's consent to keep bees in the apple orchard. Two hives have been expanded to 40 and a net profit of $1200 annually has been realized during the past three years.

A mother in Washington, D.C., decided to place a single observation hive on her apartment roof to show her children the community life of a colony. Beginning with an investment of $10, her honey business expanded so that she had to move to the country and hire a man to help.

As a hobby, beekeeping can be both interesting and profitable. You may keep as few or as many hives as you wish. If you aren't careful, though, beekeeping may sneak up on you to become a full-time business. It combines easily with almost any type of outdoor work and can be enjoyed even in large cities.

Beekeeping entails no round-the-clock care like the feeding and egg-gathering of chickens. Maybe that is the real secret of its appeal. You may work at beekeeping

↓ About 80,000 workers are busily manufacturing a money-making commodity inside this healthy hive

Photographed at Lis Honey Farm, Des Plaines, Ill.

↑ Angry bees are quieted with smoke. Only experienced beekeepers work without a veil. Right, one keeper designed this system for feeding supplementary syrup. Bees can drink from this "fountain" without drowning

on your own hours except at certain critical times—and may literally neglect them for weeks without any serious consequences. Naturally, the spring of the year when bees are most active calls for more work than fall or winter.

Many farmers are adding bees for reasons other than the hobby or profit motive. Because of a greater use of insecticides and the practice of "clean" farming which destroys the homes of many beneficial earth-dwelling insects, pollinators such as bumblebees, wild bees and others are decreasing rapidly. Honeybees are raised to insure proper pollination of apples, melons, berries, clover, alfalfa and more than 50 other important food, fruit and seed crops.

Although bees may be raised in every state, California, Ohio, Michigan, Illinois, Iowa and Wisconsin produce the largest quantities of honey. At present there are about 5,787,000 colonies of bees in the United States. With the average colony numbering about 45,000 individuals, there are more than 2,500,000,000 honey-producers and pollinators buzzing across the landscape. They produce 200,000,000 pounds of honey and 4,000,000 pounds of beeswax annually.

Equipment for beginner, exclusive of hive, includes a veil, smoker, hive tool, wire and spur embedder

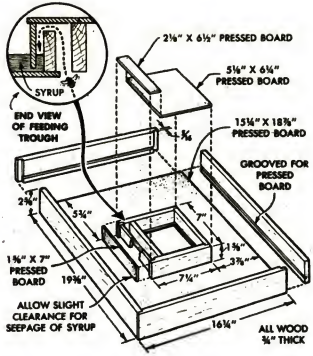
If you're interested in raising bees as a hobby, if you're going into the business to make money, or if you want to provide sure-fire pollination for your crops, you should know the proper way to start.

The best time to begin beekeeping will be next April when fruit trees and flowers are in bloom. But now is the time to get all the information you can on beekeeping and to study as much about the subject as possible. Write to your State Agricultural College, State Department of Agriculture or Agricultural Experiment Station for information. The Superintendent of Documents, Government Printing Office, Washington, D. C., also has such publications.

Practical knowledge gained through a season's work with an experienced beekeeper will prove invaluable to the beginner. But if you can't question a veteran beekeeper, acquire a couple of colonies and strike out on your own. Experience is your best teacher.

Beekeeping requires a fundamental knowledge of bee behavior and a genuine liking for the insects. Locating your colonies close to available sources of nectar is important. To insure a good crop of honey, bees should be within flying range—one to two miles—of such nectar-secreting plants as clover, alfalfa, cotton or orange trees. Good beekeeping locations are to be found in almost every state.

With proper experience and a liking for bees, a person in a favorable location can obtain a return that will compare favora-



Detail of feeding system shows how syrup flows into narrow space where bee always can touch side walls

bly with most other agricultural pursuits. Beekeeping, however, has its financial hazards and you can lose your shirt in this business as easily as in any other. A beginner should start slowly and not invest too heavily at first.

A common method of starting a colony is to purchase a package of bees—preferably three pounds with a queen—and install this package in a hive equipped with frames containing sheets of brood foundation. Instructions for installing usually come with the package.

The yellow-banded Italian bee is the variety recommended for the beginner. It is hardy, industrious, fairly gentle and can readily be obtained in pure stock since it is the most common bee in this country.

Another way to get started is to purchase established colonies. Be certain, however, that they are in modern hives, acquired from a reliable beekeeper and accompanied by a certificate of inspection to insure freedom from disease.

A beginner's minimum outfit may consist of the following: a three-pound package of bees; one 10-frame hive—including a bottom board, two hive bodies complete with frames and brood foundation, two to four shallow supers complete with frame and thin super foundation, one outer and one inner cover; one smoker; one bee veil; one hive tool; approximately 10 to 15 pounds of granulated sugar; No. 28-gauge wire; one spur embedder.

The equipment can be varied and more can be added after you have become experienced enough to manage large colonies.

Ordinarily the most satisfactory results will be obtained with factory-made equipment. However, some beekeepers prefer to construct their own hives. If you plan to do this, try to purchase or borrow a complete hive to use as a model. It is essential that all dimensions are exact. Otherwise the bees will build combs and add propolis (a gummy wax) where it is not wanted. Likewise, careful construction is necessary so that all hive parts are readily interchangeable. The standard 10-frame hive is generally used in the United States.

Here are the cardinal points of beekeeping you should know:

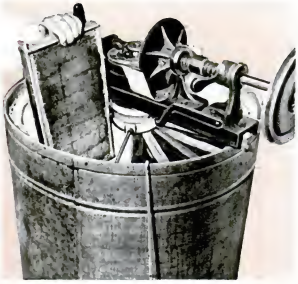
In the spring, bees need an abundant store of pollen honey (15 pounds or more at all times), plenty of room for brood rearing, a source of water, protection from the wind and exposure to sunlight.

Because swarming results in a loss of honey, it should be controlled so far as

↓ Brood foundation is a sheet of wax impressed with design of a comb upon which the bees build their honey. Right, "trap" designed for experiments scrapes pollen off the bees and deposits it in a box below the hive

Department of Agriculture photo

Uncapping knife heated by electricity slices away the wax foundation to expose honey for extraction



↑ Comb is slipped into the extractor, which revolves rapidly to throw the honey into the drum

↓ Honey is strained through a Nylon parachute into container from which it is drawn to fill the jars

Photos courtesy Lin Honey Farm, Des Plaines, Ill.

possible. What makes bees swarm is still somewhat of a mystery.

There should be empty comb space in the hives at all times preceding and during a honey flow. If every cell becomes occupied with brood, pollen or honey, the bees will stop working or swarm. Either situation causes loss of honey if it occurs just before or during a honey flow.

For successful wintering, a colony should have a young queen of high-producing stock, a large cluster of young, fall-raised bees, at least 60 pounds of sealed honey and several combs containing large areas of pollen. For these requirements a colony must have a two-story standard hive with a gross weight in October of about 130 pounds.

It is unprofitable to keep bees in box hives or hollow logs and in many cases illegal to sell such honey.

It does not pay to cultivate any one flowering plant for bees alone. Nectar resources may be improved, however, by planting such crops as sweet clover on wasteland.

Starvation is one of the principal causes of unprofitable beekeeping. If bees are short of honey stores, a syrup of two parts of clean granulated sugar to one of water should be fed. Plan carefully and avoid feeding by leaving the bees plenty of honey at all times.

Diseases cause large annual losses of bees, honey and equipment. Learn to recognize early symptoms.

While it is normal to find a few dead bees at the hive entrance, the presence of a large number indicates abnormal conditions. The presence of trembling or paralyzed bees, or bees crawling and unable to fly, should arouse suspicion.

Two of the most common abnormal conditions are poisoning by insecticides and Nosema disease. Bees suffering from these two and other harmful effects may all appear to behave alike. Laboratory tests, however, will point to the disease which is causing the loss. Sometimes a diagnosis must include an observation of the colony affected.

In many parts of the United States, beekeepers suffer losses from American or European foulbrood—two of the most serious brood diseases. European foulbrood can be controlled by proper corrective measures. American foulbrood, the more serious and prevalent of the two, requires more drastic treatment. Both bees and

(Continued to page 256)

Pastry Tube Decorates Art Objects

Ornate table pieces molded from clay are decorated with the help of a pastry tube by Orville Hanchey of Natchitoches, La. Hanchey, who is a member of the art department of Northwestern State University, molds the art objects, then forces thinned clay through the small hole in the end of the pastry tube to achieve special effects. His most outstanding piece of ceramics is a circus horse posed with a clown. Hanchey used the tube in making the horse's harness, and put hair on the clown's head with a tea strainer.

Mobile Camera Hoist

High-angle movie shots are taken on location with a mobile hydraulic hoist and attached camera platform. This innnovation was introduced by a Hollywood studio to eliminate the usual 20-foot camera towers that ordinarily are erected for each scene. The hoist is similar to those used to load large transport planes. Guy ropes tied to stakes steady the platform.

Drill Spins Brush Clean

Quickly converted from hand drill to paintbrush cleaner, a dual-purpose tool enables painters to change from dark to light paint without changing brushes. The brush is soaked in paint solvent for 30 seconds, then lifted from the liquid and spun clean and dry in about a minute. For drilling holes up to ¼ inch, the brush holder is removed and a drill chuck attached to the shaft.

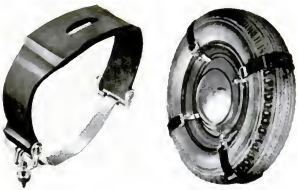
Information, including manufacturers' names, concerning products described in this issue may be obtained by writing Bureau of Information, Popular Mechanics, 200 E. Ontario St., Chicago 11

Jack for Laying Floors

Operating on the principle of a jack, a tool equipped with an anchor head, lever and plates provides tight-fitting joints when applying flooring, siding or sheathing. A hammer tap against the anchor head sets it into position on the joists, and lever action against the pressure plates squeezes the boards tightly together. The tool holds the boards, leaving the worker's hands free to pound nails.

Rubber "Chains" Protect Tire

Mud hooks made of rubber for automobile wheels can't damage tires and can be adapted for use on icy roads. Each mud hook is a slotted rubber strap that fastens over the tread of the tire. To install the hooks, a steel bracket is slipped through the wheel slot and connected to shackles on the rubber strap. For winter use, rubber "chains" are available consisting of six straps held across the tread by a steel ring on each side of the wheel. The chain can be left on all winter and cleats slipped under the straps when roads become icy.



Spotlight Throws Ultraviolet Beam

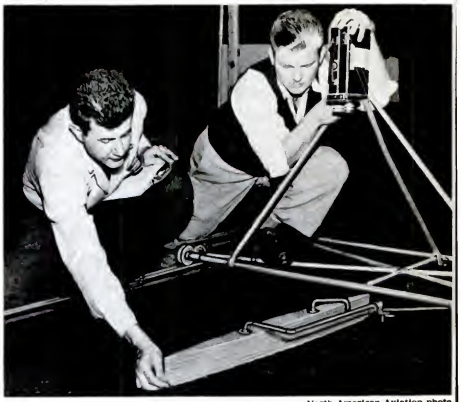
Diseases are detected and infections are prevented from spreading by a surgical spotlight which throws an ultraviolet beam. When fitted with a special filter the lamp can be used to detect the early stages of ringworm and other skin disorders which show up in characteristic colors under the rays. In other cases, the lamp can aid in preventing the spread of infection by concentrating a beam of ultraviolet rays on tissue to kill the bacteria. A transformer inside a housing built of Durez plastic energizes a special quartz-glass tubing to produce the ultraviolet rays.

Brush Guard Keeps Paint Off Glass

Shaped like an arrow, a metal guard attached to paintbrushes prevents paint from marring window glass when the sash is painted. The guard can be attached to any brush, flat or round, up to 1½ inches in width. It is useful for painting door trim or chair rails. The guard can be retracted for painting flat surfaces.

Speed of 7000 M.P.H. Simulated in Tests

Speeds up to 7000 miles an hour are simulated by towing models of plane parts through water ¼ inch deep. The water wave patterns are similar to shock waves created by high-speed aircraft. Models are towed by a wheeled stand, which also holds a camera to photograph wave patterns. While not as accurate as wind-tunnel tests, according to North American Aviation engineers, they're useful for qualitative studies of supersonic flow.



North American Aviation photo

"Flyweight" Steam Engine

Working in nickel silver, a Norwegian modelmaker has fashioned a steam engine weighing ½ ounce. Sixteen of them will fit into a pocket matchbox.

Aerocar's High Wing Affords Better View

One of Britain's most unusual looking additions in the light transport class is the snub-nosed Portsmouth Aerocar. It is a twin-boom design, with a high wing that affords passengers an unrestricted downward view. Its span is 42 feet, length 26 feet and it has two 155-horsepower engines.

Steel Bar at White Heat Punches Hole in Water

Ever see a hole punched in water? It's done every day in the treatment of steel. The "hole," with smooth walls of water, recently was photographed at the research laboratory of the United States Steel Corporation, Kearny, N. J. Because the hole lasts only a split second it had to be photographed at an exposure of 1/10,000 second. Actually the space between the bar of white-hot steel and the wall of water is filled with invisible vapor that holds back the water for an instant. Quenching gives steel new physical properties including hardness and greater wear resistance. It may be done in oil, air, water and brine.

WHAT'S NEW *For Your Home*

↑ DRYING RACK on metal ironing board provides hanger space for freshly ironed clothes. The board's all-steel frame supports on aluminum top perforated with hundreds of holes to permit rapid evaporation of moisture during ironing. The rustproof drying rack slips out of the heel end of the top. A positive lock on the frame prevents accidental closing while in use

DRIP STOPPER which holds the lid of a coffee or teapot in place has a rubber sponge to catch the runover drops

FINGER GUARDS made of Celanese plastic mask the finger while nail polish is being applied. Excess polish falls on the guard, leaving the fingers clean

MINIATURE DISHWASHER attaches to faucet, forces water over the dishes. A small cake of detergent supplies the suds

↑ BURGLAR ALARM winds up like alarm clock. Attached to window frame, it is invisible from outside, rings when raised sash pulls plug

↓ PAPER WASHCLOTH can be dried and re-used many times. Perforations hold suds for dish-washing or use in tub or shower

↑ DRIPLESS POURING SPOUTS, made in several sizes to fit milk bottles and other containers, return last drops to the bottle

DECORATIVE FIRE EXTINGUISHER at right hangs on any wall and looks like door chimes. Two "chimes" contain compressed carbon dioxide which flows from funnels to smother the fire when a valve is turned

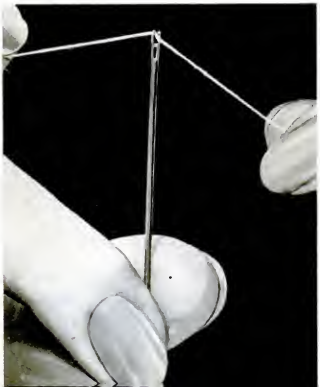
↓ HAND-CRANKED SHREDDER cuts or peels vegetables and fruit. A cover guard protects hands from the cutting cones. The shredder also crumbs soft or hard bread and cuts potatoes in waffle design for frying

Paint-Can Lip Prevents Spilling

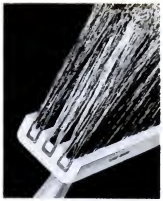
Metal lips that fit on the rims of paint cans prevent spilling when pouring the paint from one container to another. They also serve as holders for wet brushes.

Self-Threading Needle

Blind persons who like to sew are aided by a self-threading needle with a split, pronged opening which makes it possible to thread a needle by the sense of touch. The user puts the thread in the slotted top and pulls downward to secure the thread. The New York Guild for the Jewish Blind, 1880 Broadway, New York City, offers such needles free to any blind person.



Fibers Can't Pull Out of Brush



Calcimine brushes with fibers that won't pull out are made by bending the fibers in half and locking them into the block with a rectangular plug. The block is made of plastic and the plugs are bonded to the grooves by a cement that is impervious to any known paint. The brushes are designed for applying calcimine, stucco, paste and cold-water paints.

Plastic Skis

Plastic skis, requiring neither waxing nor steel edges, have been developed by Fred C. Smith of Ogden, Utah. They are made of molded laminated plastic and are flexible, yet extremely strong. Tests have demonstrated that the new skis glide well on any kind of snow. The great flexibility at the front end of the ski enables it to glide over small mounds in snow with ease. Skiing tests caused no hollows to wear in the skis. Other features of the skis, which are dark green, are the elimination of split tips, splinters and pulling edges.

Cut-Film Tank Prevents Sagging

Films can't sag or touch during development in a new developing tank for cut film and film packs. The contour of the loading grooves puts the film under tension to prevent sagging. A loading guide slides along a channel, stopping above each groove to facilitate darkroom loading. Four buttons on the bottom of the tank permit agitation by gentle rocking. The tank, which has a capacity of 12 negatives, can be adjusted to accommodate all cut-film sizes from 2¼ by 3¼ to 4 by 5 inches.

Left, silver-nitrate crystals, basic ingredient of photographic film, are piped into centrifuge basket for quick drying by new process. Right, previously the crystals were formed by slow evaporation in open dishes

Spin-Drying Speeds Production of Photo Crystals

Eliminating the slow, open-dish evaporation method, a new technique in the production of silver-nitrate crystals has been developed at Eastman Kodak. The crystals, light-sensitive material that forms the image on photographic films and papers, are produced from silver chunks dissolved in nitric acid and crystallized by continuous agitation in 1000-gallon stainless-steel tanks. Still wet, the crystals are piped into perforated centrifuge baskets where they are whirled until nearly dry. Then the process is repeated and, finally, the crystals are dumped into a rotary drying drum for complete moisture removal. The new process reduces evaporation time from several days required by the open-dish method to a few minutes.

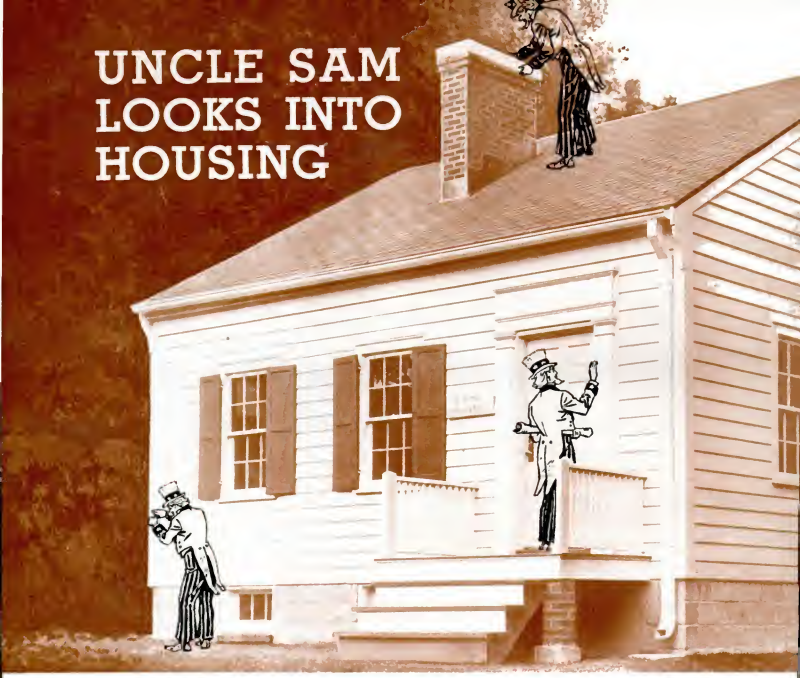
Refinery By-Product Becomes Inexpensive Refrigerant

Propane, an inexpensive by-product of all oil refineries, is used as the refrigerating gas in a new chilling machine. The compressor required for the cooling cycle operates by centrifugal force instead of reciprocating action. Carrier Corporation engineers, who designed the compressor, report that it occupies only 66 percent of the space required for the older-type machines. Because propane is used as the refrigerant, the process may open a new field of use for by-products of oil refineries. The first installation of the machine will be in a refinery where it will be used to chill oil to approximately 25 degrees below zero in order to remove the wax base.

No More Ricochets With Bullet Trap

Bullets can't ricochet when fired into a combined target holder and backstop made of heavy sheet steel. The backstop, designed for use in home shooting galleries, can be used safely with bullets up to .45 caliber. The bullets are pulverized when they strike the back wall and drop on a tray that is removable for cleaning. Cardboard targets of various sizes are inserted in a slot in the backstop. A carrying handle makes it easy to carry on vacations and picnics.

UNCLE SAM LOOKS INTO HOUSING



Floating ceilings which can be changed in height from nine to seven feet are a feature of this test bungalow erected by the National Bureau of Standards to study heating equipment for low-cost-housing projects

By John L. Kent

FLAMES were shooting out of several windows and smoke was pouring from the roof of the one-story concrete block building when one of the men in the small group watching the fire turned around and shouted for the fire hose.

The others opened a way for two men dragging a hose between them which was already spouting water. Someone shouted, "Here they come!"

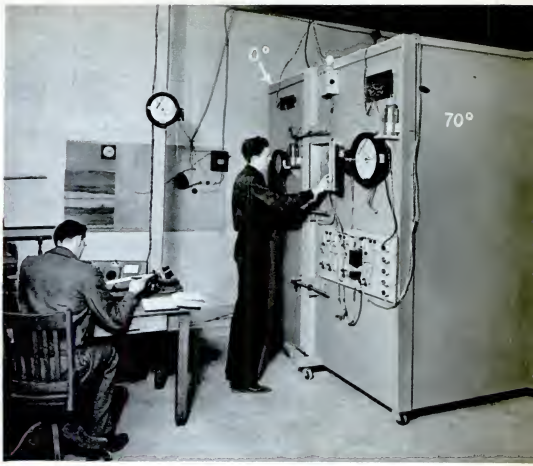
Getting a firmer grip on the nozzle which had become alive under the pressure of water, one of the two straddled the hose and pointed the stream of water at—no, not the burning building, but a small metal shed alongside.

As the water ran down the metal roof of the shed, which was not burning at all, flames were licking at the eaves of the roof of the burning structure. The would-be firemen had no intention of putting out the fire. They were merely protecting the metal shed. The fire was set by National Bureau of Standards fire-resistance engineers for the specific purpose of observing its action.

As the fire hungrily devoured the carefully prepared interior "furnishings," it was giving up some of its secrets to a little group of engineers huddled around recording meters in a brick building about a block away.

Within the burning building was a score of metal pipes extending from the ceiling into various parts of the interior. Inside these pipes were thermocouples with wire connections which carried temperature and location indication signals to the group around the instruments.

This recent test was the latest in the quest for information on fire resistance. Such an experiment is one of the methods used by housing-research scientists at the



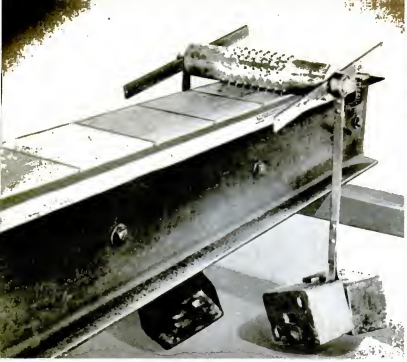
Sandwiched between heated cabinet at right and adjoining cold cabinet is an exterior wall section under test. Below, turning bolt to raise ceiling of room in the bungalow shown on opposite page

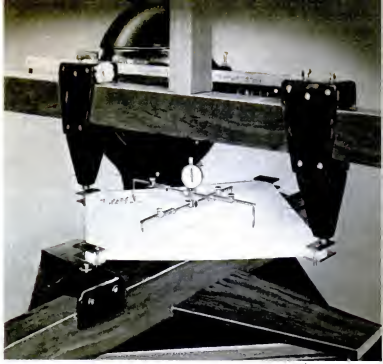
bureau's Washington laboratories to find facts which will result in making houses more fireproof, durable and economical.

The human habitation has many natural enemies such as the sun, wind, fire and water. In a score of government and private research laboratories men are seeking to find ways of combating the evil effects of nature upon man's home.

Large-scale housing research by the government was started in 1937 when Congress included $198,000 in an appropriation for the Bureau of Standards for carrying out research on materials and methods suitable for use in low-cost housing.

Early in the program engineers realized that the need was for research directed toward the house as a whole rather than toward the individual materials of which the house was made. The manufacturers of building materials have for many years been utilizing the facilities of the bureau to test their products, but no one had ever tested a complete housing unit. While every

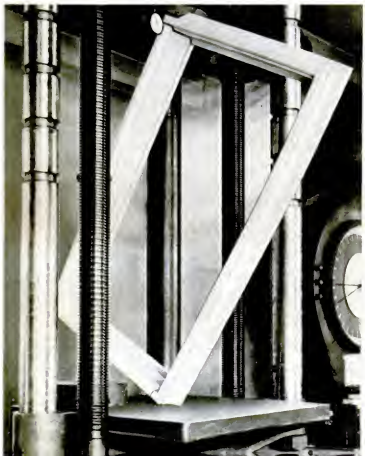




Above left, testing wood flooring section with heavily weighted roller studded with hobnails. Indentations are carefully noted. Above right, testing wood panel with machine which applies upward pressure on two opposite corners and downward pressure on the other two corners

← Nail-pulling machine tests holding strength of building materials

Below, putting squeeze on window frame from opposite corners to test strength at famed Forest Products Laboratory



manufacturer would guarantee the performance of his product, no one would assume the responsibility for the house as a whole even though his product was used extensively in its construction.

The bureau immediately began testing not only the materials of construction such as brick, steel and cement, but also complete components such as walls, roofs, windows and doors. The climax was the erection last year of a complete bungalow on the bureau's grounds.

A house to be livable must be heated during the winter in the greater part of the United States. Heating a house costs money. To hold heat in the building the owner usually insulates his home. Yet, some of the heat escapes.

Bureau of Standards engineers worked out a unique method of measuring heat losses through walls, thus pointing the way to improved insulation.

A shielded "hot box" heat-transfer apparatus was built consisting of two cabinets, each with one open side. The wall specimen to be tested is sandwiched between the open sides of these cabinets.

One cabinet is known as the cold box and temperature in it is kept at zero degrees F. The other cabinet, known as the hot box, has an inner box called the metering box, which contains recording instruments. Heat is generated within the hot box and given a gentle motion by electric fans to promote uniformity of temperature. Heat losses are calculated from air and specimen-surface temperatures which are measured by thermocouples and thermometers.

One of the oldest problems of the homeowner is the accumulation of moisture within the outside walls during cold weather. Ironically, air conditioning, devised to make houses more comfortable, is making the problem worse.

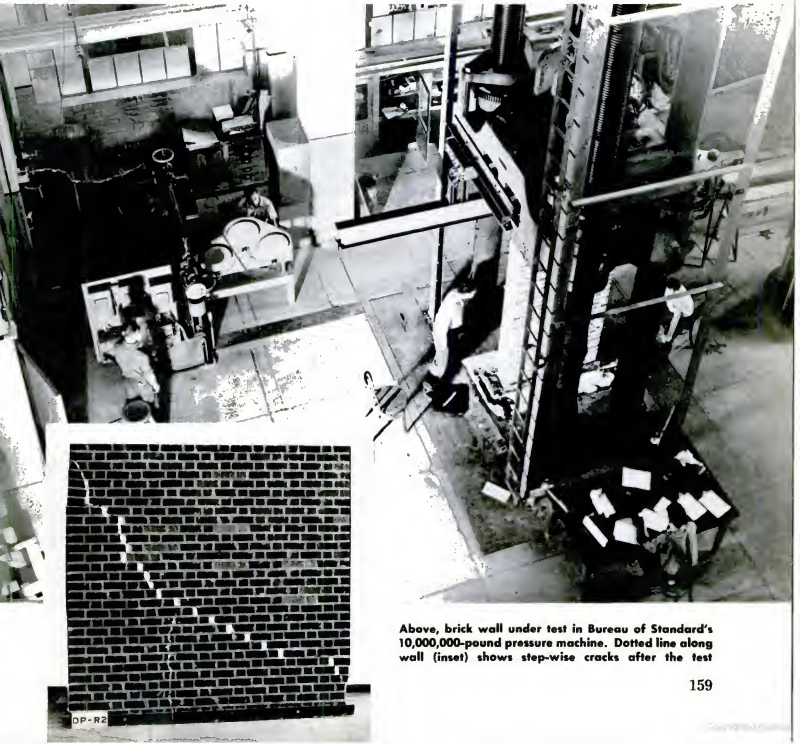
"Newly developed methods of adding moisture to the air by so-called air-conditioning heating units," say bureau technicians, "have produced conditions that are conducive to the condensation of moisture within walls unless adequate measures are taken to prevent vapor entering from the warm sides."

Several experiments have already been carried out to find information on how best to prevent condensation. In one experiment seven wall sections, each representing a specific type of frame construction, were installed in a test structure. Wood and fiber sheathing were used. A vapor barrier consisting of a 2-ounce copper foil bonded with asphalt to a backing of kraft paper was placed at various locations within the wall. Several of the sections were not provided with this copper barrier.

The humidity and temperature of the inside air were controlled to produce an average vapor-pressure drop across the wall of about ⅕ pound per square inch.

Condensation of moisture occurred in every instance where no vapor barrier was used on the warm side of the wall. In all instances where condensation occurred, the accumulation of moisture was greatest at the bottom of the walls, near the sills. This accumulation would, in all probability, result eventually in the decay of the sill and of the lower ends of the studding.

The addition of a moistureproof sheathing paper to the cold side of a wall tended to cause an accumulation of moisture between the walls even when an excellent barrier was used on the warm side. No difference in this respect was found between the performance of walls of standard wood frame construction and those sheathed with fiberboards. But, a vapor seal should not be used on the cold side of outside walls if inside air is humidified.



Above, brick wall under test in Bureau of Standard's 10,000,000-pound pressure machine. Dotted line along wall (inset) shows step-wise cracks after the test

During burning building test below, the instruments above registered 450 temperature readings for various parts of building; temperature went to 2200 F.

Modern civilization has brought another new problem in house building, especially in our cities. Most of us want to keep out street noises, and soundproofing is thus an important consideration in modern house construction.

At the Bureau of Standards a unique reverberation chamber is used to test the sound-absorption qualities of wall and ceiling coverings. The reverberation chamber is really a building within a building. It has no windows and only one entrance. This entrance is closed by a series of four doors and is separated from the outside wall of the building by a dead air space.

If no sound-absorbing material is in the chamber, noises will echo back and forth between the walls for a considerable time.

When tests are to be made, various sounds of known intensity are produced through loud-speakers. These sounds are picked up by microphones and the length of time it takes for them to die away is measured. The material to be tested is then placed on the floor of the chamber and the same sounds are made again. The sounds die away more quickly than they did when the room was empty. The more quickly the sounds disappear, the more sound-absorbent the material is.

The reverberation chamber test is one of

(Continued to page 248)

"Traveling" Forms Speed Canal Work

Eliminating the need for handmade wooden forms, a $57,000 machine provides the mold for making 25-foot concrete barrels to line irrigation canals. Used in the Bureau of Reclamation's Columbia Basin Project in eastern Washington, the machine consists of two telescoping inside forms and one outside form. The concrete is poured between them. When it has hardened, the forms are withdrawn and reused.

Math Speeds Tests Of Photo Solutions

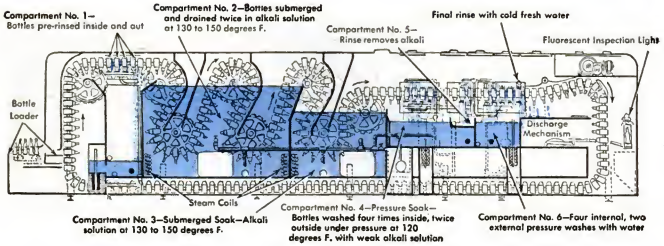
Mathematical equations are eliminating time-consuming chemical analysis of photographic solutions used in continuous-bath processing. The new equations, worked out in Kodak Research Laboratories, determine the degree of dilution and exhaustion of developer, rinse and fixing solution.

Grip for Putter Guides Hands

Golfers are guided in the correct way to hold a putter by a grip finder that lines up both hands. Made of Tenite plastic, the guide is cut away at each end at the proper angle to keep the hands together and the thumbs in line. The guide is fastened to the putter with adhesive tape and can be adjusted to the spot on the handle which feels most natural to the user.

DDT Checks Elm Disease

DDT is effective in battling the spread of the Dutch elm disease that menaces American elms, according to entomologists of the U. S. Department of Agriculture. The insecticide kills bark beetles that carry the disease fungus from sick trees to healthy ones. Entomologists recommend that healthy trees be sprayed twice each season, first with a two-percent solution, then 75 days later with a one-percent solution. This kills the beetles before they begin to feed. Dying or dead trees should be sprayed with a mixture of oil and DDT to kill beetles before they can migrate.



Giant Machine Washes 16,800 Bottles an Hour

Beverage bottles are washed at the rate of 16,800 an hour by a soaker-hydro washing machine 48 feet long and weighing 65 tons. It holds 12,768 bottles and operates automatically. Bottles come in one end, pass through six compartments, and are cleaned for 30 minutes by pressure water jets and successive soakings in caustic solutions at temperatures up to 180 degrees. Sparkling clean and sterilized bottles come out the other end where they are picked up by a conveyor to be filled, capped, mixed and cased automatically. The machine was built by the Heil Co., of Milwaukee.

Clip Holds Window Open

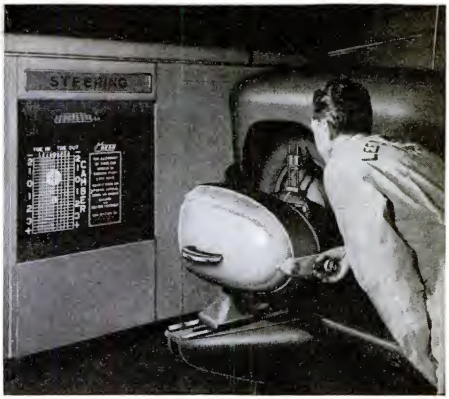
Windows are held open without weights by a small spring clip that is attached to the outside edge of the sash. A metal staple on the opposite side of the window keeps it centered between the uprights. Conventional frames are not necessary as the device can be used in windows installed against studding.

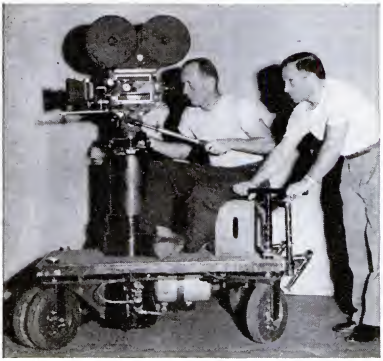
Sugar Cane Yields Valuable Wax

Wax is processed from the waste fiber of sugar cane through a process developed at the Houma, La., laboratory of the U. S. Department of Agriculture. The wax may replace expensive carnauba used in manufacturing shoe polish, phonograph records, carbon paper and floor and furniture polishes. About 850 pounds of fully refined wax can be processed from 1000 tons of cane. More wax could be recovered each year from U. S. sugar cane than was used before the war.

Twin Light Beams Align Wheels

By the use of cross-hair projectors, automobile wheel alignment is accomplished quickly and accurately. Two projectors, one for each front wheel, send light beams against gridded charts to show the exact amount of correction needed. The cross hairs are enlarged eight times by projection to make a ⅛-inch correction become an inch movement on the screen. As corrections are made to the wheels, the cross hairs move across the charts showing the mechanic when the wheels are in exact alignment.



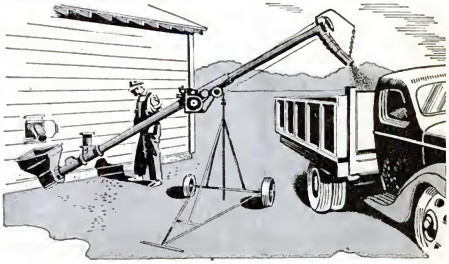


Dolly for Movie Cameras Has Four-Wheel Steering

With direct steering of all four wheels, a new camera dolly enables movie cameras to travel in any direction while following actors around the set. Steering is controlled by a bar mounted at the rear of the dolly. Previous dollies moved forward and backward only and required a specially constructed track. The camera, mounted on a hydraulic lift, can be raised from 36 inches above the floor to a height of 70 inches. Because of its mobility, the new dolly permits continuous filming of action lasting up to three minutes that formerly required as many as 28 different film sequences that were later pieced together.

Spiral Grain Loader

Mounted on an adjustable tripod, a spiral grain loader can be swung and tilted by hand without moving the wheels. It can be raised high enough to load bins from the grain truck or lowered to load from ground level. Powered by a small gasoline engine located near the center of the 18-foot tube, the 6-inch spiral moves from 10 to 17 bushels of grain a minute.

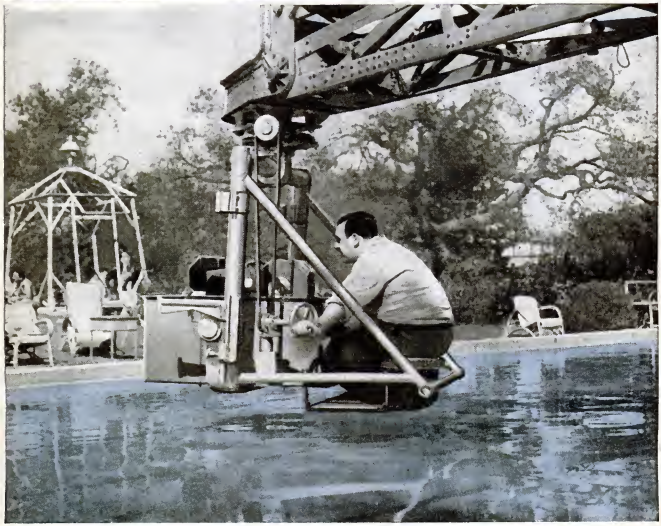


HINTS *from a* HOLLYWOOD "PRO"

Small cameras are what Sidney likes for personal "shooting." Auxiliary lenses and other accessories equip him for all conditions. Here, he's using a camel's-hair brush to dust off the lens of one of his cameras

★

But when he goes to the studio, he works with big cameras. Below, the director is suspended from an overhead boom as he checks the angle of an enclosed camera that will be lowered to take underwater movies



GEORGE SIDNEY is like the postman who takes a walk on Sunday. He collects salary checks from Metro-Goldwyn-Mayer as a motion-picture director, and on or off the set he's always shooting pictures.

Any ordinary camera fan would go green with envy over the opportunities that are Sidney's. Being surrounded by such photogenic subjects as Lana Turner and Esther Williams and a few hundred other stars and starlets he should never run short of targets, displayed under the best lighting and improved by the best of makeup.

He does pack his camera all over the lot and he does shoot the stars. But he prefers the candid snapshot and nature-made lighting and he thinks some of his best photographs are unguarded portraits of his friends. The enlargements that come from his darkroom are often as impressive as if a whole studio crew had worked a full day to capture the effect.

"Some amateur snapshots show a friend obviously having his picture taken. He stands stiffly in the middle

In his chair beside the big sound camera, Director Sidney raises his reflex to take a candid photograph of some action on the movie set

From his collection of prints, Sidney points out an interesting cloud shot he enlarged from a miniature

Until his new home with a built-in darkroom is finished, Sidney uses a big enlarger at the MGM studio

With a telephoto lens on a 35-mm. camera, he takes candid photos on the set from the director's chair

Sidney and a camera crew film the graceful patterns formed by girls swimming below the camera platform

distance staring at the camera," Sidney says. "Pictures like these seem a waste of film to me. It's better to get close to your subject and make half a dozen candid shots from different angles. Forget about the pose and concentrate on getting a sharp, well-exposed negative. A twin-lens reflex is good for this work.

"Probably most of your pictures won't be worth printing, but there will be some that stand out. I take as many as 500 snaps a month and some of them are terrible.

"You will be surprised at how good some of your shots appear when you enlarge them. The little 2¼ by 2¼-inch contact print doesn't look important, but an 11 by 14 enlargement of the same negative, mounted on stiff board, with your name signed under it, often attracts attention."

Taking good pictures, Sidney says, requires practice the same as playing good golf or good tennis. Take at least one picture every day and between photos practice estimating exposures by picking out a camera shot and estimating the amount of light present. Check your estimates now and then with a meter. It's wise to use a tripod or some other rest. Even a neck strap helps steady the camera if you pull against the strap. Instead of using many different films, standardize on one slow emulsion for outdoors and one fast emulsion for indoors.

The movie director likes pictures shot from odd angles and this has paid off in his profession. Sidney goes under water with a camera crew to make movies of swimmers and he climbs aerial platforms to shoot scenes from directly overhead.

He has invested hundreds of dollars in lenses and attachments for his 35-mm. camera, but he's partial to his reflex. It uses convenient 120 film and produces a square negative that is large enough, when fine-grain developer is used, to permit giant enlargements.

"The pictures that you like are the ones that you should enlarge and hang up for everyone to see," Sidney says. "Not everyone may agree with you on the fine points of a photograph, but, after all, it's your picture. Hang it up and enjoy it."

Recordings on Redwood

Phonograph recordings are made on thin slices of redwood by Ben Shuemaker of Eureka, Calif., who developed the novel disks as souvenirs for tourists. Wood used in the recordings comes from burls which develop from buds that remain dormant instead of growing into branches. Shuemaker splits cross sections 1/40 inch thick from the burl and cements one slice of the wood on each side of an aluminum disk. When the cement is dry the record is sanded and a layer of shellac 1/500 inch thick applied. After the surface is polished the recording is made with a small recording machine. Studio recording equipment cannot be used because the needle cuts too deeply into the wood. Tourists record personal messages on the redwood disks.

Dye Detects Cancer Tissue

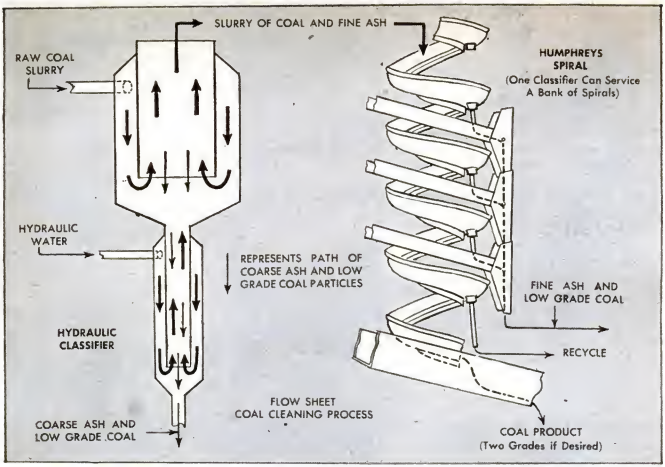
Removal of cancer tissue by surgery is aided by the use of a dye that glows under ultraviolet light. The dye, sodium fluorescein, is injected into the patient's vein three to eight hours before the operation. Under ultraviolet light, the cancer tissue glows with a vivid yellow color making detection easier. Good results were obtained in 31 out of 46 cases, with most consistent success in brain-tumor operations.

Firemen Burn "Tenement" In Safety Demonstration

With a five-story "tenement" especially constructed for the occasion, members of the New York Fire Department recently demonstrated fire-fighting techniques in Madison Square Garden. Under the glare of spotlights, smoke pots poured fumes from the windows and firemen raced up and down the ladders to put out the fire. The demonstration was part of a show to raise money for the department's welfare fund.

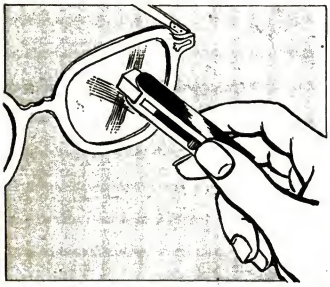
Reflecting Buoys

Channel buoys with reflecting collars that pick up searchlight beams are making night shipping safer in New England harbors and the Mississippi River area. The Coast Guard has equipped several thousand buoys with collars made of sheet metal coated with crystals. Similar to reflecting signs, the markers are red or black, depending upon the color of the buoy.



Water Stream Separates Impurities From Coal

Impurities are removed from bituminous coal through a new process that lowers the ash content, decreases sulphur and increases the recovery of coal that is mined. Developed by Donald A. Dahlstrom of Northwestern University, the process ferrets out impurities by gravity. The instrument used is a two-inch pipe placed inside a three-inch pipe. A current of water flows up through the inner pipe at a rate of 20 to 25 gallons a minute. The coal to be purified passes through the outer pipe and then into the stream of water, where the impurities, having a higher density, fall against the current to the bottom of the instrument and the lighter coal passes out through the top. The partially-cleaned coal then passes down a spiral track, where the fine ash and low-grade coal separate from the premium coal.



Liquid oxygen injections, in combination with water injection, boost a 2000-horsepower engine nearly 300 horsepower.

Eyeglass Cleaner in "Lipstick" Case

Eyeglasses are polished with a cleaning compound held in a small container much like a lipstick case. Pulling down a knob on the container ejects the wax-like compound from the top. Used once a day, the original supply of compound will last about six months. Refills are available.

Radar Aids War on Disease

Radar is replacing short-wave diathermy in heating living tissues for treatment of certain diseases. Since radar can be beamed and localized like a spotlight, there is no need for encumbering cables, pads and toweling commonly used with short-wave diathermy. Medical use of radar was under study as early as 1937, but military use of equipment forced a postponement of the work until after the war.

The CRAFTSMAN

★ "Jeepers," we call it, and that's what the neighborhood gang will exclaim with envy when your youngster rides by in the sidewalk "jeep" shown on page 178. It's more than a toy—it runs! The plans are clear; it will be tough to turn down demands that you build it. "Jeepers" has automotive-type steering, welded frame, and electric-motor drive through a hydraulic transmission. Start building today for spring showing.

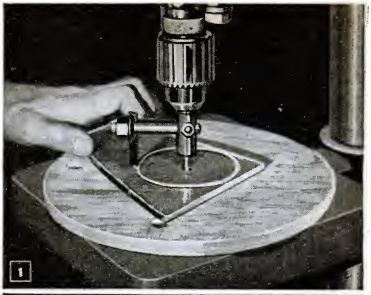
★ Many hobbyists turn a neat profit from spare-time weaving of rugs, table runners and similar items. An article on page 188 tells how to build a table-top loom with several features that make weaving easier.

★ On page 210 we present practical helps for servicing fluorescent lights, correcting ballast hum, testing the tubes and improving light efficiency.

★ Want to cut your own records, with sound effects? An N.B.C. engineer tells, on page 194, how to produce sound effects to make home recordings more dramatic.

PLASTIC LAMPS

By R. BARSAMIAN

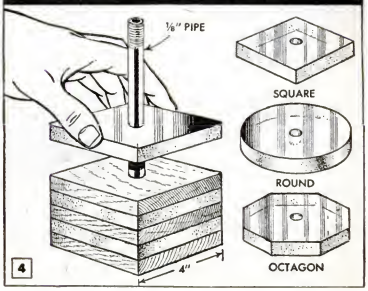


1

A fast way to cut spacer disks from sheet plastic is to use a circle cutter in a drill-press chuck. Uniformity is had, and, a cutter having a pilot bit of proper size, will form pipe hole at same time

THOSE CHOICE BLOCKS of fancy wood that you have been saving from other jobs will do nicely in combining wood with plastic to make attractive "laminated" lamp bases at very little cost. Layers of aluminum, interspaced with layers of plastic, can be used, or all three materials, plastic, wood and metal may be combined to produce unusual and distinctive bases. Size, shape and thickness of the laminations make the number of variations almost endless. You can cut them square, all the same size, or, every other one can be made smaller to serve as spacers between the

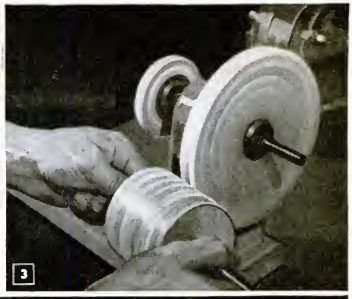
"Disks" may be round, square or octagonal, of plastic, metal or wood. Aluminum or brass spacers combined with clear or colored plastic, or laminations of fancy wood, make attractive bases



4

Furniture You Can Build p 140

Sanding rough edges of the disks on a belt is done at one time by mounting disks on a pipe shaft, letting the shaft rotate in wood blocks as shown. Same setup could be held in lathe to dress edges

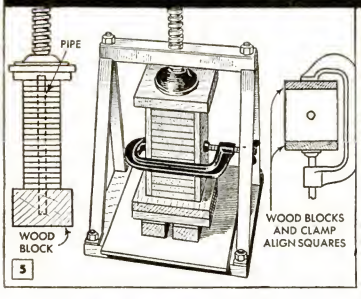


Polishing is done while disks are still on shaft. Cloth buffing wheel, charged with rouge and rotating at high speed, produces high luster quickly. Keep work moving across wheel to prevent "burning" plastic

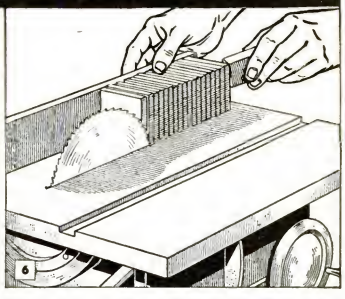
plastic. The same applies to bases built up of disks. Variety also is achieved by using, alternately, layers of clear and colored plastic. Still another variation is had by combining thick and thin layers of two different materials as shown in Fig. 8. Here, for economy, the plastic layers should be kept thin as the cost of plastic in thick sheets is somewhat expensive, especially in ¾ and 1-in. sizes.

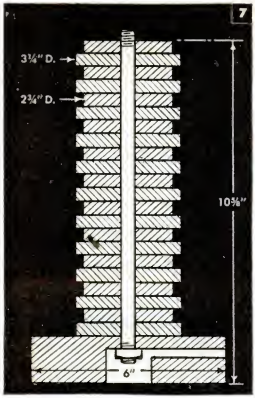
Figs. 1 to 3 inclusive show progressive steps in mass-producing disk-shape laminations of plastic. Those of one size are cut, drilled and grouped together on a shaft for final finishing all at one time. Assembly of the lamp bases is shown in Figs. 4 and 7 and is typical in building up each base regardless of design. Essentially, the layers, whether round, square or octagon shaped, are coated with cement and slipped over a length of electrical fixture pipe and then clamped. A strong cement for bonding plastic to plastic or plastic to wood and metal is made by mixing ethylene dichloride (available at most paint stores) with fine shavings of clear plastic to a consistency of thick syrup. Do not use until the mixture is entirely dissolved and clear. Pour some of the cement into a shallow container, such as a

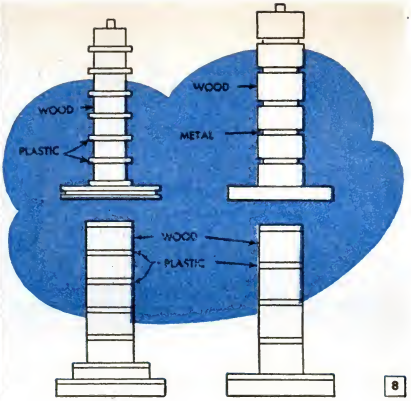
In assembling square or octagon shapes, edges of the layers are aligned and kept flush by clamping blocks temporarily to opposite sides. Veneer press provides even pressure, but C-clamp can be used



Any unevenness too great to remove by hand sanding can be trimmed flush with a power saw, provided the work is not too large. Use a fine blade and pass the work slowly to prevent chipping plastic laminations







saucer, and coat the surface of each lamination by dipping it into the cement. Work fairly fast as the cement has a tendency to dry quickly. In clamping the assembly, apply sufficient pressure to eliminate air bubbles, but avoid squeezing out all of the cement. A veneer or paper press is ideal to provide uniform pressure, but you can use a couple of large C-clamps. In clamping square-shaped laminations, the setup shown in Fig. 5 should be used to align the edges. Remove the wooden guide pieces before the cement sets, however. Any unevenness too great to remove by hand sanding can be trimmed flush with a fine saw blade or a cutoff wheel as in Fig. 6. The base piece of the lamp is drilled according to the sectional view in Fig. 7 for the lamp cord. Then the two parts of the base are held together by a washer and nut fitted to the end of the pipe.

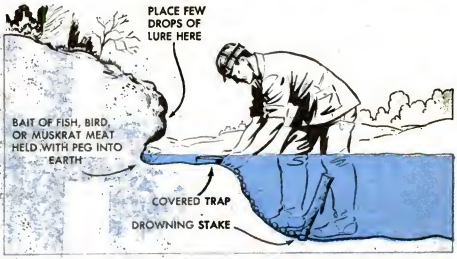
A word about sanding and polishing plastics: Sawed edges of the material must be sanded perfectly smooth and all tool marks removed. If a lathe is available, the edges of disks can be trued and sanded glass-smooth by mounting them on a shaft and chucking between centers. A cloth buffer is used to polish plastic by holding it against a wheel charged with rouge.

Novel Pin-Up Lamp Glows To Light Up Silhouette Encased in Bulb

Suitable as a night light, or purely for decoration, this novel pin-up lamp employs a special gas-filled bulb which produces a faint glow of fluorescent quality to illuminate a silhouette inside the bulb. This type of bulb can be purchased at most electrical stores. The sconce or bracket part of the lamp consists of a "reflector" of clear plastic having a socket-fitted block screwed to it. The block is bored to take the inside portion of a regular push or key-type, drop-cord socket. Remove the brass shell and switch buttons and wire it with a length of lamp cord. Then press the socket and its fiber sleeve into the hole in the block, running the wire out through a hole in the bottom. Be sure that the switch is in the "on" position before encasing it in the block. A mirror may be used instead of plastic.—Newell Hartley, Devon, Conn.

Three Good Trap Sets That Fool the Wily Mink

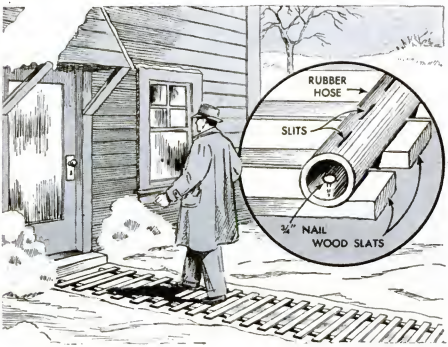
If there are mink in your locality here are three good trap sets that should get results. When setting the traps, if it's at all possible, stand in the water to avoid leaving any scent that might warn the animal. A lure is used and one suggested here is made from trout heads. Place them in a wide-mouth jar which is left standing in the sun until an oil forms. Strain this and pour it into a bottle that is tightly stoppered. The first location, shown in the top illustration, is on the shallow shelf of a stream that has an overhanging bank. A few drops of the lure are placed on the bank and the bait is pegged to the ground behind the trap and secured with a drowning stake driven in deeper water. The other two locations are blind sets and require no bait. In one the trap is placed near a tile drain, and in the other it is where a spring-fed brook drains into a larger stream. In both cases the stake is pegged in deeper water.



R. A. Jenkins, St. Louis, Mo.

Tread Built From Hose and Slats Makes Slippery Sidewalk Safe

Assembled from two lengths of discarded garden hose and wooden slats, this auxiliary walk or tread will prevent slipping on an icy sidewalk and it does away with having to sprinkle the walk with ashes or salt. It is necessary to remove snow, but not a thin layer of ice, before "laying" the walk. During the time when it is not in use it can be rolled up and stored. To make the tread, slits are cut in the hose and nails are driven through them into the slats, as indicated in the detail.



Keeping Fishing Hole Free of Ice

To retard freezing over of holes cut in the ice for fishing, pour enough glycerine or olive oil on the water to form a thin film. This will keep the holes open for some time.

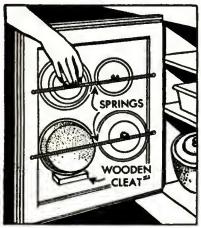
Solving HOME PROBLEMS

Racks formed from heavy wire and nailed across a paneled door as indicated above provide hat holders

Leave part of the top on a carrot for a grip as below, and it can be grated without injuring the fingers

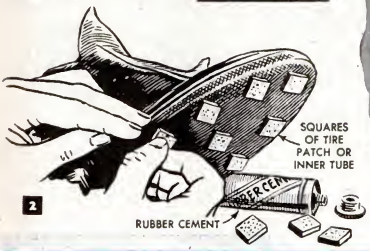
Above, to wash vegetables and be sure that dirt is rinsed from them thoroughly, set an inverted wire dish rack in the sink and lay the vegetables on top. Then allow water from the faucet to run over them. A spray attachment will help you do a better job

Below, screen-door springs attached across the inside of kitchen-cabinet doors will hold pot covers and pie tins. Use a wooden cleat as a ledge to keep pie tins under spring



A screw-top jar with a slot in the cover as below, provides a handy "bank" in which to drop buttons when removing them from old garments, or when they come off while laundering

1

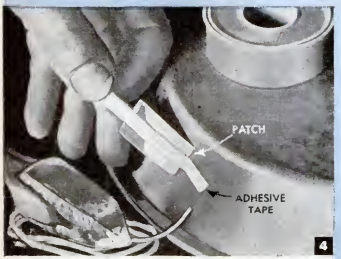


2

3

1. An attractive globe for an outside entrance light can be made from a wide-mouthed coffee jar having a frosted top and bottom and a clear band around the center. The jar will fit into globe holders of many types. For decoration, and also for protection from broken glass, add a guard of sheet metal strips riveted together

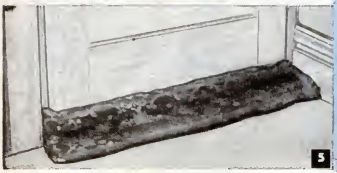
2. When the soles of a pair of rubbers or galoshes wear smooth so there is danger of slipping on ice or snow, "retread" them with pieces of rubber cut from a tire patch or inner tube. Cut the material into squares and, if using patching, apply by following directions on the container. If inner-tube rubber is used, rubber cement makes a good adhesive



4

3. Unless anchored in some manner, venetian blinds will rattle against the window frame if the window is open and there is a breeze. This can be eliminated if cup hooks are screwed into the sill and screw eyes are fastened to the ends of the bottom strips of the blind. Engage the hooks in the eyes and provide tension by raising the blind slightly

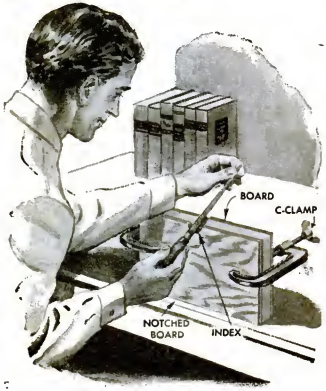
4. Adhesive tape will hold a metal patch in position on a sloping or curved surface while it is being soldered in place, thus leaving both hands free. Shape the metal patch to the curvature of the surface to be repaired, and then tape it in position. Tack-solder the patch, then remove the tape and complete the job. If adhesive from the tape adheres, remove it before applying the solder



5

5. During the winter, cold drafts are apt to leak through the space between the bottom of a door and the sill, causing uneven room temperatures and an increased heating bill. This will be prevented if a draft "stop" is used. It is made from a piece of fairly heavy cloth about 8 or 9 in. wide and as long as the width of the door. Sew a seam along the side and one end, leaving the other open. Fill with sawdust, loosely packed, and close the open end

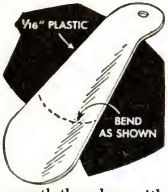
Books Thumb-Indexed With File And Notched Boards



Thumb-indexing the pages of books to be bound or books already bound is a simple operation requiring two notched boards, a couple of C-clamps and a round file. The boards serve as clamping jaws and as a guide in filing. The notch in the facing board is cut half round to suit the size of the thumb index desired, while the notch in the rear board is cut somewhat smaller to produce a tapered notch in succeeding pages. The pages for each section are clamped together tightly and flush with the top edges of the two boards. Then the paper is filed down to the depth of the notches. Guide boards are shifted for each section, so the notching will be staggered. Remember that the final page of a section is not notched, as it has the index letter.

R. S. Martin, Iowa City, Ia.

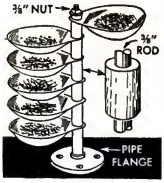
Shoehorn Made of Scrap Plastic



For the beginner working with plastics, here's a way to make a shoehorn by using a small piece of 1/16-in. plastic material. Cut the piece to the approximate shape shown in the drawing and smooth the edges with fine sandpaper. Drill a hole in the top to hang the horn. Then heat the plastic to about 300 deg. F. in an oven and bend as indicated by the dotted line. Shape the top to provide a grip.

Frank Shore, New York City.

Sectional Rack for Small Parts



This rack is ideal for the workbench because any particular tray can be swung within easy reach while the others are out of the way. The trays are hammered from sheet-metal disks, each one having a lip drilled for the 3/8-in. rod that serves as a standard. Spacers between trays are wooden spools. A pipe flange into which the standard is screwed serves as a base.

Fred Strickland, Portland, Ore.

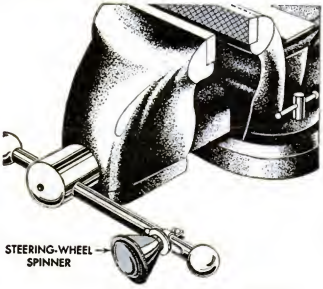
Long-Nosed Pliers Useful in Kitchen

Keep a pair of long-nosed pliers in the kitchen drawer as a utility tool. Among the uses for the pliers are: Removing pin feathers from a chicken, lifting hot pads from a stove, pulling out skewers and opening cans that require key openers.

W. S. Head, El Cajon, Calif.

Steering-Wheel Spinner on Handle Speeds Vise Operation

If a steering-wheel spinner is attached near one end of a vise handle, opening and closing the vise will be easy and quick. The spinner is especially convenient when setting and adjusting work because the knob can be located without removing your eyes from the work in the vise. To keep the spinner clamp from slipping, wrap friction tape around the handle where the clamp is fastened.



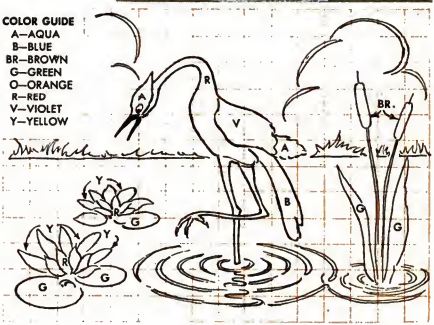
'Painting' With DYED FEATHERS

By Elma Waltner

"PAINTING" pictures with feathers is merely the trick of arranging dyed feathers over the traced outline of some familiar object, such as a bird or bouquet of flowers. Start with white feathers, preferably chicken feathers plucked from the breast or back. Do not use wing or tail feathers with heavy, stiff spines. Wash feathers in mild soapsuds and warm water to remove the natural oil. Rinse thoroughly.

Ordinary fabric dyes are used. Follow the dye manufacturer's directions as to quantities and methods of preparation. Feathers usually dye best if dipped when wet. Right after rinsing is the time to dip so have the dye ready then. Dip the whole feather so that the color "takes" uniformly. Place on newspapers to dry, taking care that the feathers are not curled when laid on the paper.

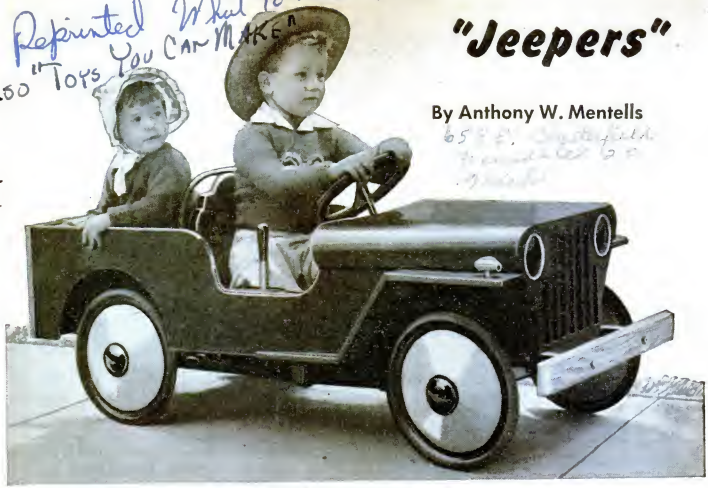
Details below give crosshatched outlines and key the colors of the feathers used in making the bouquet and bird pictures shown in the photos at the right. Notice in the details that the flower petals and leaves are made by gluing the colored feathers over the outlines. However, the vase is painted directly on the paper using either blue water colors or artists' oil colors. Likewise, in the bird picture the lilies, pads, and the body, head and tail of the bird, and the heads and leaves of the cattails are made by gluing the colored feathers over the outlines. Balance of the details are filled in with water colors. Pictures are framed under glass in ordinary picture frames which can be hung on the wall or made into attractive serving trays by gluing handles to the frames as indicated in the lower photo. Short lengths of dowel in various sizes make attractive handles.

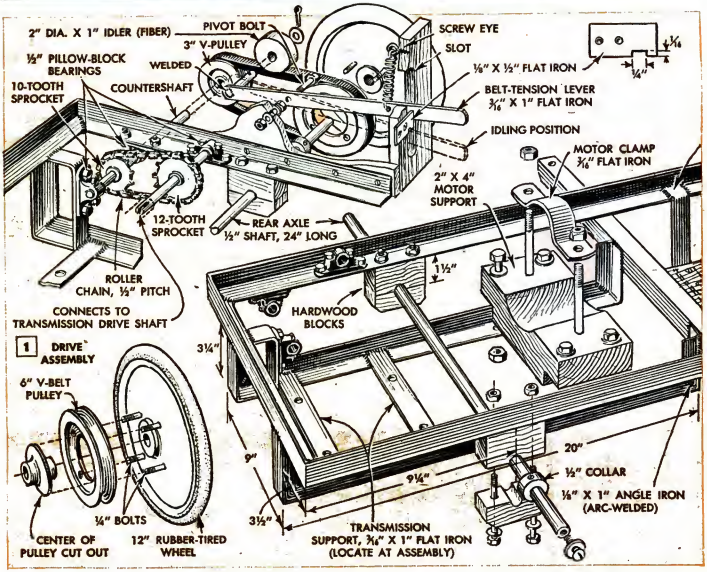


Reprinted What to Make '49
Also "Toys You Can Make"

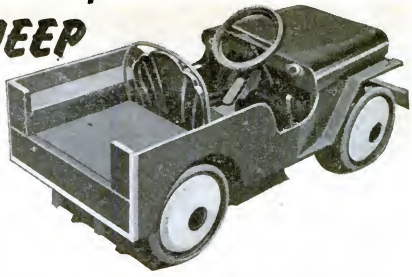
"Jeepers"

By Anthony W. Mentells





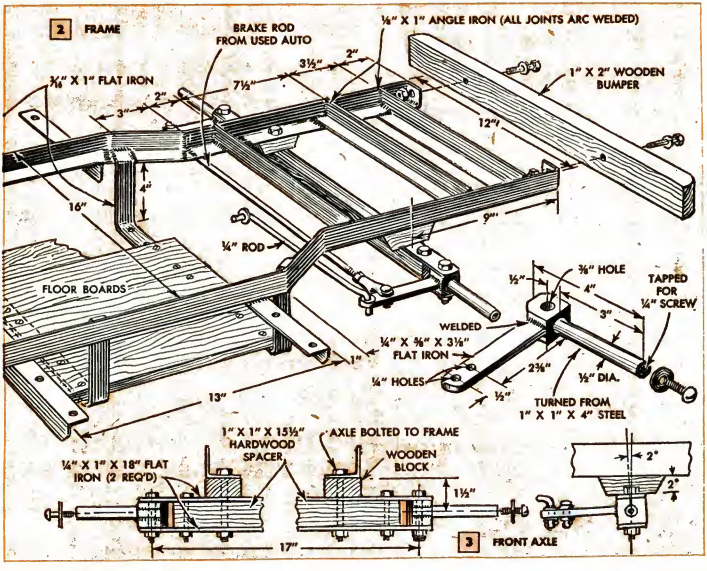
a Sidewalk JEEP

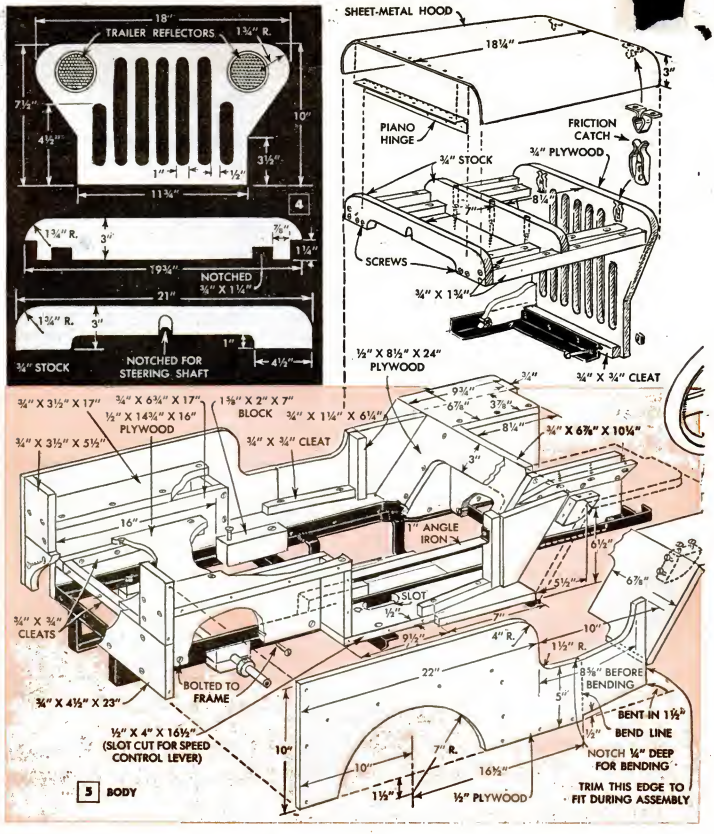


Powered by an auto-starting motor, it's just the right size for sidewalk use. Without motor, it's an ideal coaster or pusher

THERE are happy playdays in store for lively youngsters when dad decides to build this sidewalk jeep. "Jeepers" looks and runs very much like the real thing, and by using second-hand parts it can be built for less than $50. Special features are auto-type steering gear, auto-starting-motor drive through a hydraulic transmission, and electrically welded angle-iron frame.

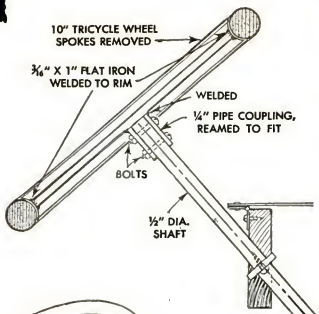
Start with the frame detailed in Fig. 2. Care should be taken to get the three cross members at the front spaced according to the dimensions given. In assembly, the front axle is mounted on wooden blocks, or pads, while the rear axle is supported in split hardwood blocks bolted to the side frame members. The latter are offset 2 in. on each side, giving a front width of 12 in. and a rear width of 16 in. Floor boards and the transmission and starting-motor mountings are carried on underslung supports, or cradles, as shown in Fig. 2. Fig. 3 details the construction of the auto-type front axle. Wheel spindles are turned from 1-in. square cold-rolled steel. Steering arms are welded to the square section of the spindle, which is drilled at the center of the square section for a ⅜-in. kingbolt. Note that when assembled, the axle is set





to a 2-deg. caster to make steering easier.

The countershaft, Fig. 1, runs in pillow-block bearings and carries a 10-tooth sprocket for ½-in. pitch roller chain. Drive from the transmission is through a 12-tooth sprocket to the countershaft as detailed in Fig. 1. Outboard end of the transmission-shaft extension is carried in a pillow-block bearing bolted to the frame. Although not shown, a shaft collar may be required between the bearing and the sprocket to prevent end play of the extension shaft due to the pin-coupling drive. Drive from the countershaft to the rear wheel is through a short ½-in. V-belt and pulleys as detailed in the upper view, Fig. 1. A V-pulley is attached to the left rear wheel as in the lower detail, Fig. 1. A lever-controlled idler rides the slack side of the V-belt and, when in driving position, places sufficient tension on the belt to transmit power from the countershaft to the rear wheel. Only the wheels rotate, the rear axle does not turn. When the controlling lever is placed in the



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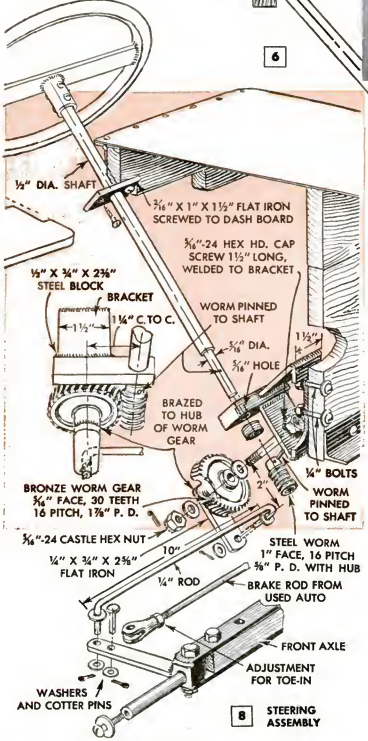
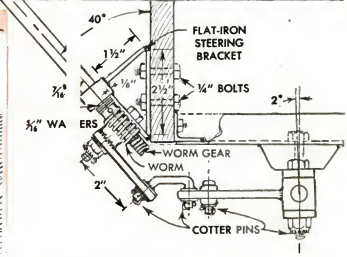
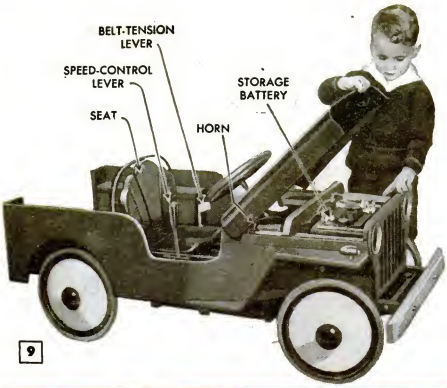


8 STEERING ASSEMBLY



idlin position, tension on the belt is re-
lease and the jeep can be pushed about
easil as the belt is sufficiently slack to slip
on th countershaft pulley.

Th body is detailed in Fig. 5. All parts
are ined with screws and glue. It will
help f you study the top and bottom
view Figs. 11 and 12, before assembling
the arts. Wheel-well covers form side
seats or extra passengers in the rear com-
parti ent. Hood frames and the grille are
detai d in Fig. 4. The hood is formed from
shee netal with opposite edges rolled to a
1 3/4-i radius. Note that the hood is at-
tach to the "instrument" panel with a
conti uous hinge. Friction catches of the
type sed on cabinet doors hold the for-
ward end closed and keep the whole thing
from rattling. A metal ventilator grille of
the l iver type used in window ventilators
is at ched to the back of the grille, and
trail "caution" reflectors are mortised
into e front side of the grille to simulate
light As will be seen from Figs. 7 and 9



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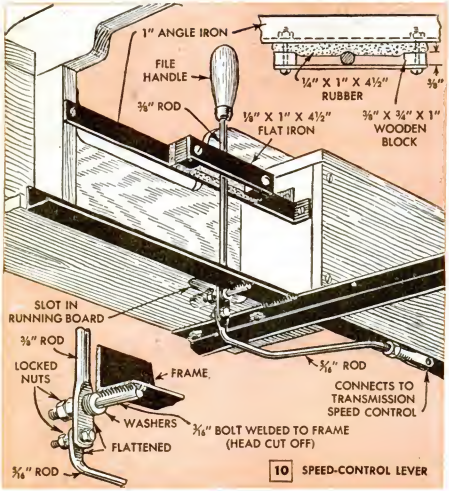


10 SPEED-CONTROL LEVER

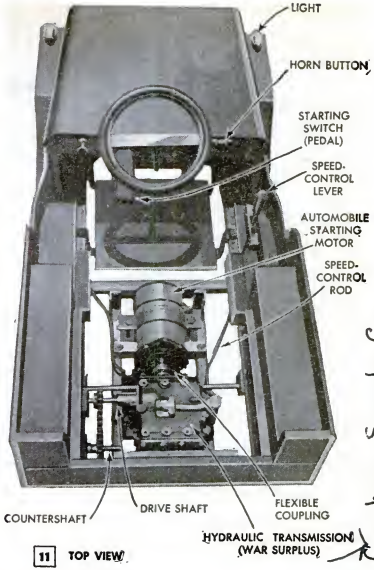
a part of the space under the hood is partitioned and floored to form a compartment for the storage battery. Use a 6-volt auto-type storage battery of 100-ampere-hour output rating.

Complete details on the installation of the steering gear are given in Figs. 6 and 8. The worm-gear assembly is mounted on a triangular bracket formed from three pieces of flat iron and bolted to the dash panel. A steel block welded to the outer ends of the bracket side pieces is drilled to form a bearing for the lower end of the steering shaft and worm gear, Fig. 8. A piece of flat iron mortised into the bottom of the instrument panel at an angle forms the upper bearing for the shaft. A steering arm is brazed to the hub of the worm gear. A hex-headed cap screw welded to the supporting bracket forms the shaft for the gear, and a pinned castle nut and washer hold it securely. Steering tie rod is made from a discarded auto brake rod, the adjustable yoke on the rod providing a means of adjusting the front wheels for toe-in. Steering wheel is a tricycle wheel with spokes and hub removed and a piece of flat iron welded across the rim. This is bolted to the steering shaft as in Fig. 6.

Next, the speed-control lever is mounted on the right side of the driver's seat as in Fig. 10. The hydraulic transmission, shown in place in Figs. 11 and 12 and obtainable with bronze spline shafts as war surplus, is of the type that was used to drive tank turrets and is very sensitive and smooth in operation. It is mounted on the underslung cradle in such a position that the drive-shaft extension aligns with the pillow-block bearing bolted to the main frame, Fig. 2. The auto-starting motor is clamped into a saddle made from a hardwood block. Care must be taken to get this block cut to the correct size so that the starting-motor shaft aligns with the drive shaft on the transmission. Drive from starting motor to transmission is through a conventional flexible coupling. Starting motor should be in good condition. Clean the commutator and brushes before installing. An ordinary auto-starting switch with

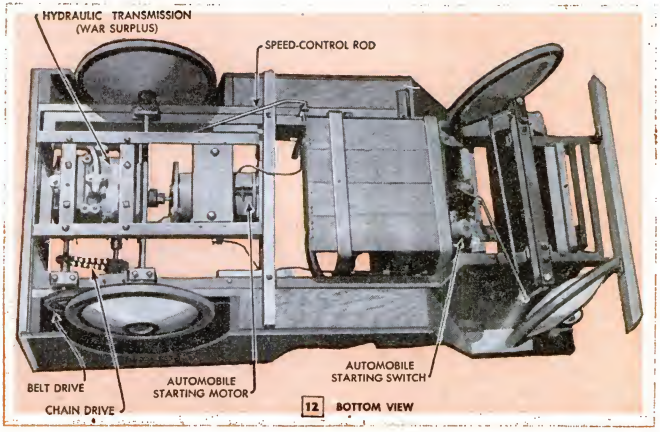
pedal is installed under the dash, as in Figs. 11 and 12, to control the motor. Install cable from battery to motor and to the starting switch. Ground from battery to the jeep frame in the conventional way. When the drive is completely installed connect the control-lever rod to the speed-control arm on the transmission. Slight movements of the control lever give forward and reverse speeds.

The wheels shown have solid-rubber tires. Somewhat easier riding qualities and still more realistic appearance can be had by fitting pneumatic-tired wheels, although these will be more expensive. The seat and back from a child's lawn chair make a good driver's seat. Or, you can make one of the bucket type, the back being rolled from sheet metal. Weld a length of 3/16-in. metal rod to the edge of the back and finish smooth. Bottom of the seat can be cut from pine and upholstered in imitation leather. All wooden parts of the body should be sanded thoroughly and the corners and edges of the parts rounded and sanded smooth preparatory to finishing. Apply a sealer coat to the wood first, then finish with two coats of enamel or lacquer, preferably sprayed, for a professional-appearing job. The name "Jeepers" can be stenciled or hand lettered on the side of the hood, or across the bumper.



11 TOP VIEW

Groban Supply Co
1507 S. Michigan
Chicago, Ill.



12 BOTTOM VIEW

Pillow Slip Protects Fine Garments In Washing Machine

It is not necessary to wash silks and other fine garments by hand to guard against the damage they sometimes suffer when laundered in the washing machine along with other clothing. Simply place several of the garments in a pillow slip and pin or tie the open end. Garments may be removed from the slip and run through the wringer separately or may be wrung dry by hand.

False-Front Chest of Drawers Conceals Writing Desk

If there's an old chest of drawers around the house, it can be made into a writing-desk-and-chair unit that's ideal for a child's room or in some other place where the appearance of the desk is not too important. As the illustration shows, the drawer fronts are removed and mounted on several panels, one folding down to serve as a writing surface while the other has a chair fastened to it. The top drawers are used for papers and writing supplies.

Easy Way to Thread a Needle

To thread a needle easily, hold the eye against a white background so that both it and the thread can be seen clearly. This works especially well when using dark thread. The same principle can be applied when threading a sewing machine if a piece of white paper is held behind the needle.

Margaret Tatroe, Edmonton, Alta., Can.

Oilcloth Pockets on High Chair Hold Infant's Accessories

Pockets or envelopes made of oilcloth and fitted with tie strings can be attached to an infant's high chair to hold such necessities as a bib, silverware, etc. The pockets are tied to the chair at seat level. It's a good idea to provide the pockets with snap fasteners to keep the baby from getting into them.

Polishing Transparent Plastics

Try an abrasive cleaner of the type used on auto bodies to give a bright sheen to objects made of transparent plastic materials. Apply the cleaner as you would a polishing compound, using a paper dustcloth folded two or three thicknesses to form a soft, resilient pad. This combination will impart a brilliant luster to the plastic surface.

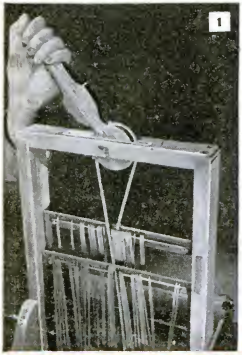
Dorothy E. Kilmer, Gloversville, N. Y.

X404

MAKE WEAVING

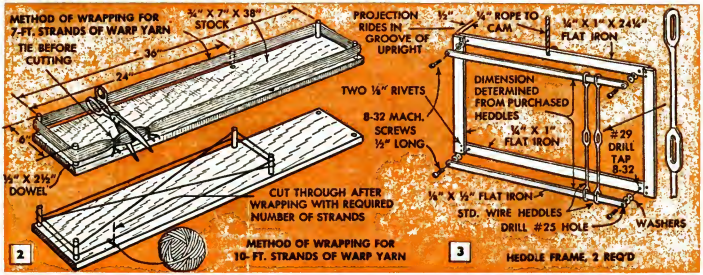
Many people have made weaving a profitable hobby with table-top looms like this one, which has several features to make the work easier and faster

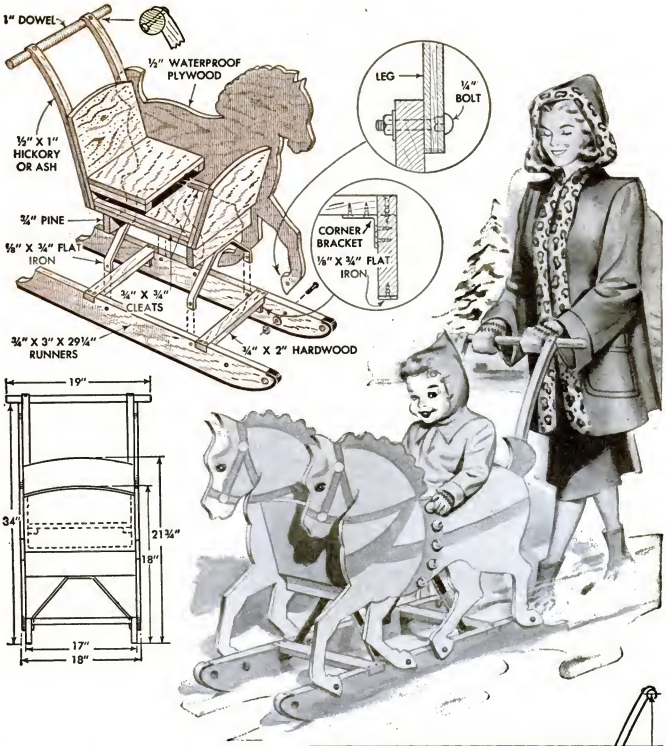
By
Stanley J. Drazek



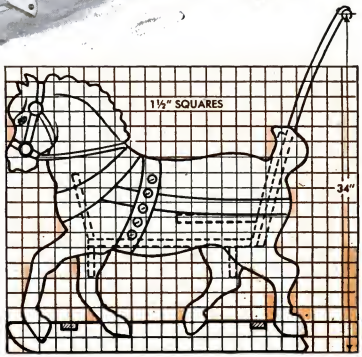
WEAVING scarves, table runners, scatter rugs in varied colors and similar articles is not only an interesting pastime for long winter evenings, but it also can be developed into a profitable hobby. Once you have mastered the technique with a little practice, you will be able to produce woven articles that will find ready sale at a good price.

With the loom pictured above, you can produce many salable articles. It consists of a frame which supports such moving parts as the warp and whip beams, heddles and frames, a reed or beater and a shuttle, the latter being a separate part which is manipulated by hand. The shuttle carries the weft thread through the shed, a triangular space between the warp threads which is made by shifting the heddles after each stroke, or pass, of the shuttle. The beater or reed, hand-operated on small looms, is pivoted to the frame of the loom and is for the purpose of beating the weft thread into the warp after the shuttle has passed through the shed. The table loom detailed in Fig. 4,



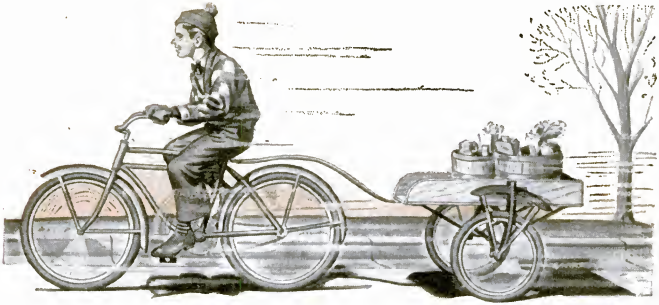


PONY SLEIGH



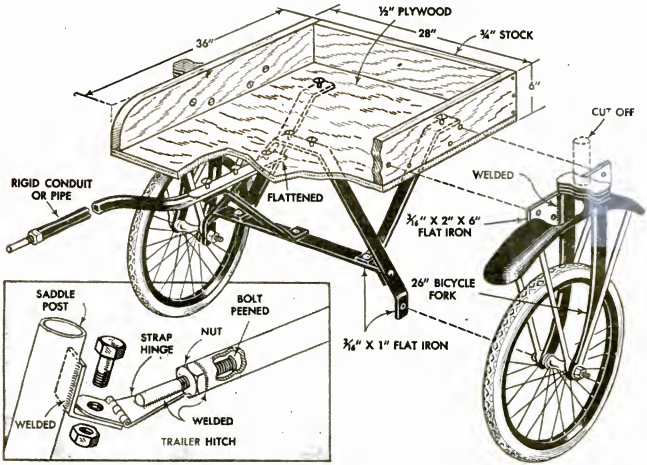
Any small child will be happy riding between these prancing ponies that are "harnessed" with jingling sleigh bells. A feature of the sleigh is that the seat is high enough so a child can be lifted in or out without having to bend over. Method of assembly, dimensions and materials are given in the detail and the pattern for sawing the ponies is shown on the crosshatched drawing. The hickory or ash handles are steamed and bent to shape. Finish the sleigh in bright colors.

Hi Sibley, Nuevo, Calif.



BICYCLE PICK-UP TRAILER

With a "pay load" capacity of about 300 lbs., this bicycle trailer is a welcome piece of equipment for light-delivery work. When not used for commercial purposes, it is handy to transport equipment on a camping trip or, if fitted with a removable seat, it can be used to carry an extra passenger. The bed of the trailer body is made of ½-in. outdoor plywood, and the three side pieces are of ¾-in. solid material. Glue-and-screw construction is used. Mounting the flat-iron chassis and the bicycle front-wheel forks and wheels comes next. They must be aligned so the wheel spindles will fit the holes drilled for them in the chassis. This is determined by trial. Before finally bolting the parts in place, be sure the fit and balance are correct. Sections cut from wide-type fenders are used as mud guards, and they are braced at each end with regular fender brackets. Construction of the trailer hitch is given in the detail. Note that it pivots to allow for movement between the bicycle and trailer.



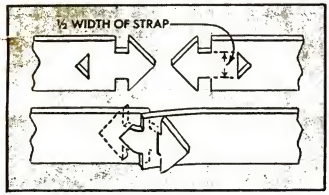
Vibration Dampeners for Power Tool Made From Rubber Heels

Small bench machines sometimes set up annoying vibrations when operated on individual floor stands. A good way to remedy this is to cut rectangular sections from ordinary rubber heels and bolt them to the legs of the stand, two sections, or blocks, to each leg as shown. The lower ends of the rubber blocks should project ¼ in. or more below the end of the leg. Dampeners made in this way not only quiet the machine effectively, but retard any tendency of the stand to creep while the machine is in operation.

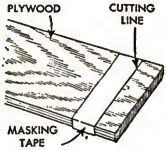
J. A. Richards, Saco, Maine.

Mending a Broken Leather Strap

Without using rivets or thread, a broken leather strap can be repaired in the manner shown. The two ends are trimmed to the shape of an arrowhead, and triangular pieces are cut out where indicated. Interlocking the ends completes the repair.

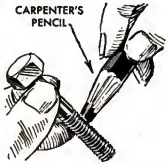


Masking Tape Prevents Splintering When Sawing Plywood



One way to keep plywood from splintering when making a crosscut is to wrap a strip of masking tape around the board just inside the cutting line. Best results are obtained if several layers of tape are used. If you want to keep both cut ends from splintering, wrap tape on both sides of the cutting line.—Opie Read, Jr., Chicago.

Pencil Lubricates Bolt Threads



Providing an easy-to-carry lubricant, the lead in a carpenter's pencil, applied to bolt threads, will cover them with a lubricating coating of graphite. Be sure that the lead is rubbed thoroughly into the threads because graphite does not adhere as readily as a liquid lubricant. China marking pencils, which contain wax, can be used also.

Repairing Crack in Distributor Cap

A common source of ignition trouble that will cause an auto engine to misfire or fire erratically is a cracked distributor cap. This is because high-tension current follows the crack and jumps from one lead to another, resulting in short circuits. This may occur when you are miles from a garage where a new cap cannot be obtained. However, if you have a pocket knife, it is possible to make a temporary repair that will work until you can get a new cap. Simply cut a hole in the center of the crack and then close the hole either with a wooden or rubber plug. The plug acts as an insulator.

has two new features which make operation easier and faster. The heddles are shifted by a cam arrangement mounted on the top cross member of the frame and operated as in Fig. 1. Second important feature is the adjustable beater pivot detailed in Fig. 4. This adjustment gives five different positions of the beater pivot and enables the weaver to keep the reed always at 90 deg. with the cloth for more uniform work. A cloth beam fitted with a removable spline, Figs. 4 and 7, makes it unnecessary to tie knots in the warp threads when stringing the loom preparatory to weaving.

Before starting assembly, determine the size of the loom from the maximum width of cloth you desire to weave, keeping in mind, of course, the size limitations of the table-top type. As an example, the loom detailed in Fig. 4 is designed for a cloth width of 24 in. A smaller size also can be made with an over-all width of 16 in. for a cloth width of 12 in. This size is especially suited to weaving table runners, scarves, etc. Hardwood

TEXTILE TERMINOLOGY

WARP BEAM: The roller of a loom upon which the warp is wound.

HEDDLES: Vertically held parallel wires having an eye in the center through which the warp is drawn.

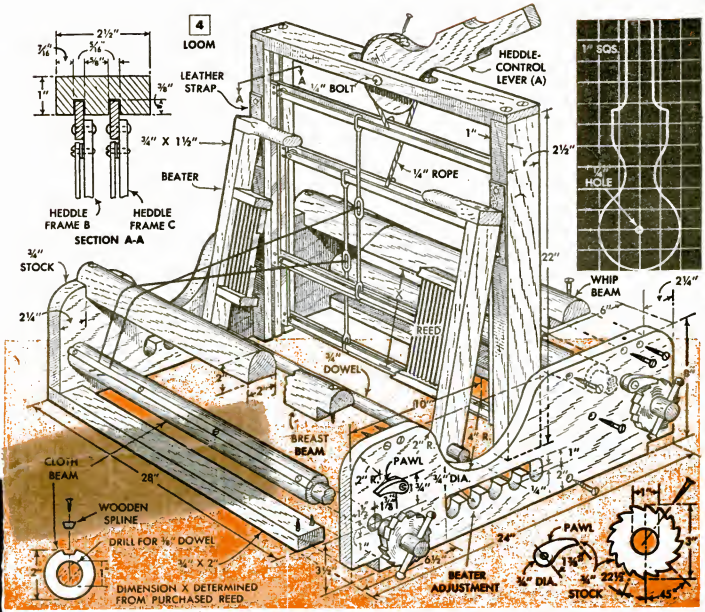
WARP: Threads that pass through heddles and reed.

SHED: Space between warp when heddles are raised or lowered.

WEFT (WOOF): Threads or yarn interlacing the warp at right angles.

SHUTTLE: An instrument upon which weft is wound for passing through warp shed while weaving.

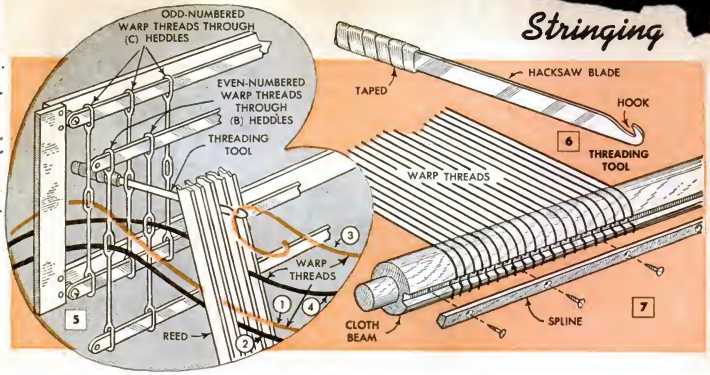
REED (BEATER): A device to comb or beat the weft between the strands of the warp.



FOR HEDDLES, ETC.— STEEL HEDDLE MFG. CO. 3110 W. ALLEGHENY AVE. PHILADELPHIA, PA.

WATSON-WILLIAMS MFG. CO. LEICESTER, MASS.

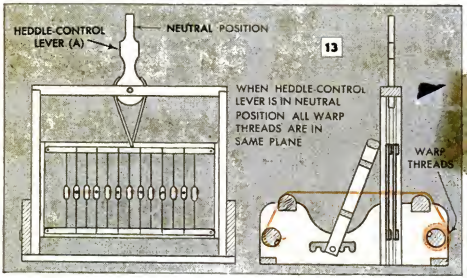
HOWARD BROS. MFG. CO. WORCESTER, MASS.

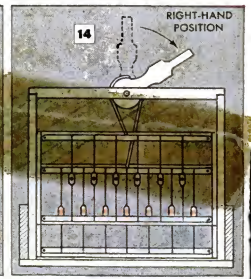


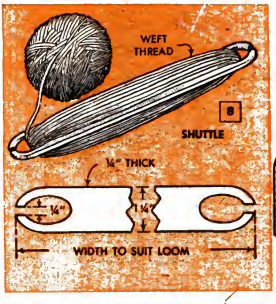
is used for all parts of the loom frame, the beater frame, rollers, and the breast and whip beams. Maple is good but birch does equally well and saws and planes somewhat easier. The heddles and heddle frames, Fig. 3, and the reed may be purchased from dealers in craftwork supplies. These parts are inexpensive and obtaining them ready-made saves a lot of time. For average weaving a 30-dent reed—30 spaces per inch—is satisfactory, as running the warp thread through each dent will give 30 warp threads per inch. Other combinations are possible.

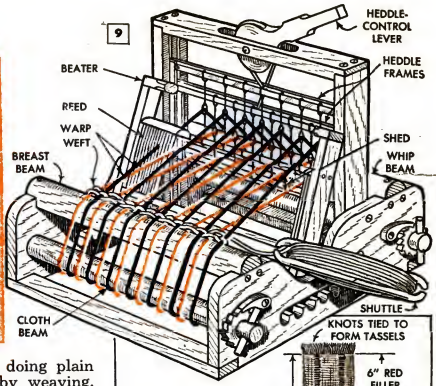
The heddle frames slide in grooves cut in the frame uprights, Fig. 4. The grooves should be about 1/16 in. oversize so that the frames will slide easily. Two dimensions, one on the heddles in Fig. 3 and another on the reed in Fig. 4, must be determined from these parts. Have the parts at hand before assembling the loom. Hardwood ratchets and pawls on the rollers, Fig. 4, are for the purpose of keeping tension on the warp threads and for rolling up the finished cloth on the cloth beam as the weaving progresses.

Fig. 2 shows methods of cutting 6 and 10-ft. warp yarn, or threads, to exact length. This done, you string the loom as in Figs. 5, 6 and 7. Notice in Fig. 5 how the odd-numbered warp threads are pulled through the heddles (C) with a threading tool made as in Fig. 6. The even-numbered threads go through the heddles (B). Both sets of threads pass over the whip beam and are wound on the warp beam at the rear of the loom. Study Fig. 9, which shows the warp threads in exaggerated size and in two colors for clarity. Also compare with the shed formed by shifting the heddle-control lever, Fig. 13, to the right-hand position as in Fig. 14. Fig. 7 shows how the ends of the warp threads are locked to the cloth beam with a spline which fits in a groove cut in the roller. Figs. 13 to 15 inclusive show the



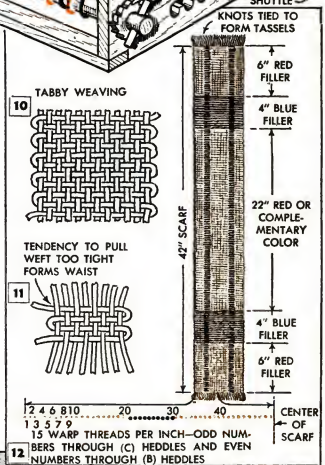


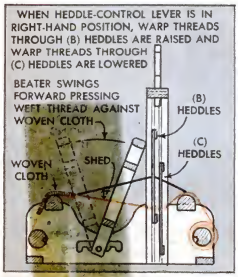


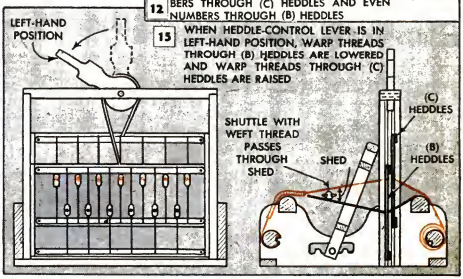


operation of the loom when doing plain weaving. Fig. 10 shows tabby weaving. Notes on the detail drawings, Figs. 13 to 15, explain the sequence of operations clearly. One thing to watch in weaving is the tendency to pull the weft too tightly. This forms what weavers call a waist, Fig. 11, and causes the woven strip to become narrower as the weaving progresses. Generally, tension on the weft must be watched more closely on coarsely woven cloth. The greater the number of warp threads per inch the less tendency there is for this fault to appear in weaving.

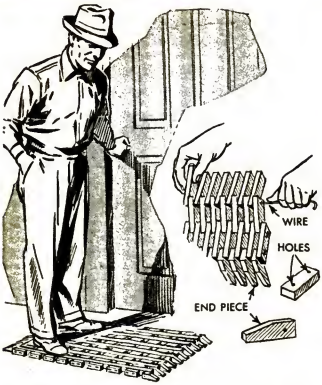
Fig. 12 shows a vari-colored pattern woven in a table scarf. Here variations are made in the warp threads and two shuttles are used, one carrying the red and one the blue filler or weft. Shuttles are made from a strip of hardwood with the ends shaped as in Fig. 8. Length of the shuttle should be approximately half the width of the cloth being woven, although some weavers prefer a shorter shuttle.







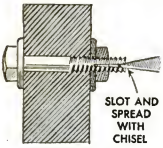
Accordion-Fold Door Mat Of Hardwood Scraps



This novel wooden door mat folds into a small bundle when not in use and opens out, accordion fashion, to lie flat. It is an interesting project for the individual craftsman and also is a good commercial item for small woodworking shops that make use of hardwood scrap, as it can be mass-produced almost wholly on a circular saw by setting up to cut duplicate small blocks from ½ or ¾-in. scrap stock. For a mat of average size cut the blocks ¾ by 1 by 4 in. Exact dimensions are not important but the blocks must all be the same size. Note from the detail that the end pieces are beveled. Two holes large enough to take No. 9 wire are drilled through each block. Then the blocks are arranged with the ends alternately overlapping and are pinned together with lengths of wire.

Ralph C. Taylor, Pueblo, Colo.

Cutting and Spreading Bolt End "Locks" Nut in Position



If bolt threads are worn or stripped or if a bolt is subject to vibration, the nut can be made to hold by spreading the end of the bolt. To do this, split the end of the bolt with a hacksaw before it is inserted in the hole. Then, when the bolt is in place and the nut has been drawn up, spread the end with a chisel to lock the nut. This will not damage the threads and the nut still can be removed.

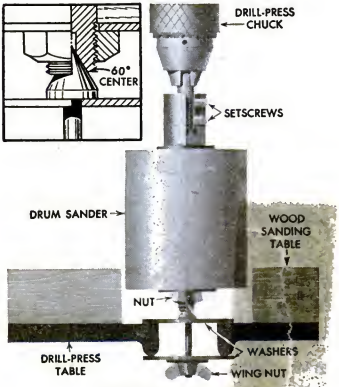
Glycerine Protects Rubber Stamp From Deterioration

Glycerine, if applied occasionally to the imprinting surface of a rubber stamp that is used infrequently, will be found effective in preventing the rubber from deteriorating to the point where it no longer will pick up ink. A thin application is all that is needed to keep the rubber soft.

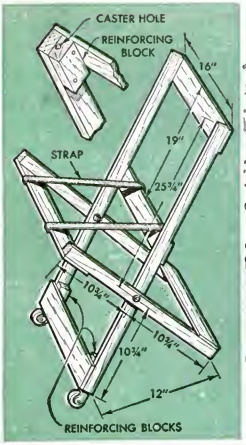
Sanding-Drum Tail Center Eliminates "Whipping"

Chucking a sanding drum in a drill press is common practice, but here is how you can eliminate the usual whipping that results from the pressure of work against the drum. As shown in the detail, the device consists of an improvised tail center, which clamps in the center hole of the drill-press table. The end of the sanding-drum spindle is cupped to match the conical shape of the center and aligning of the two is done automatically by leaving the wing nut loose, lowering the spindle to ride on the point and then tightening the center. Lubricate the center, and add a wooden auxiliary table to the drill press.

Alexander Graham, New York City.

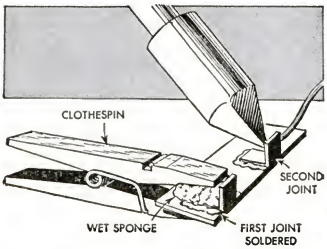


Lightweight "Cart" For Wash Basket



Much of the drudgery of wash day will be eliminated if this wash-basket cart is used when hanging clothes on the line. Although it is sturdy enough to handle a full basket of damp washing, it is light in weight and, when not in use, requires no more space than a folding chair. Frame construction and dimensions are given in the detail, although the latter can be varied. Use glued-and-screwed joints so they will be sufficiently rigid to support the weight of the basket and clothing. The only hardware items needed are the bolts and washers on which the two sections pivot. Discarded leather belts will do for the two straps. Note that reinforcing blocks are used to mount the casters. Drill the caster holes so that the shanks will be a snug fit. Although fairly small casters are shown, if larger ones are used it will be easier to wheel the unit about on the lawn. When not in use, hang the carrier on a wall in the laundry where it will be out of the way.

R. Hoppough, Waukegan, Ill.



Wet Sponge Prevents Heat Transfer When Soldering Adjacent Joints

If you have ever had a freshly soldered joint loosen when soldering another one adjacent to it, here is a simple method of preventing heat from being transferred from one joint to the other. Just apply a wet sponge to the joint that has been soldered. In some cases, it may be necessary to clamp the sponge in position. A spring-type clothespin is ideal for this purpose on a small joint.

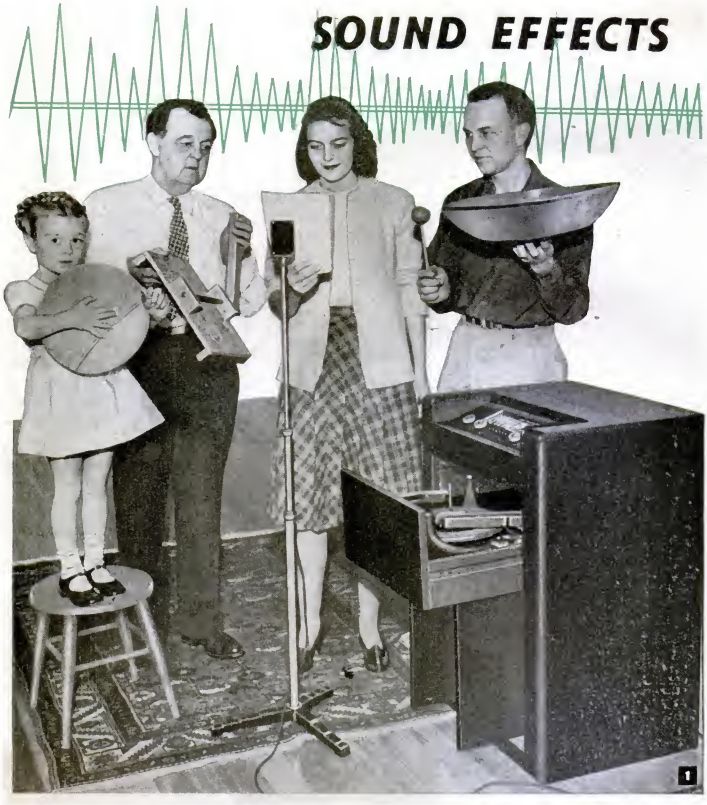
Ronald Eyrich, Milwaukee, Wis.

Rubber Soles Protect Floor Mat

Don't let your heels wear holes through the floor mat of your car below the brake and clutch pedals. Cement a pair of rubber half soles (boot size) to the mat where it receives the most wear. If this is done with a new mat and the soles are renewed from time to time, the mat will last indefinitely.

Scott Soyer, Chicago.

SOUND EFFECTS



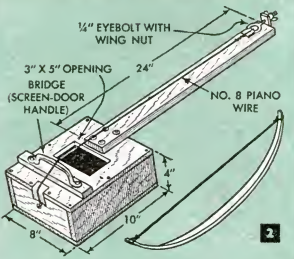
1

By Ed Ludes

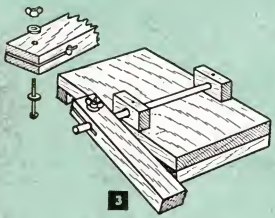
Sound Engineer, National Broadcasting Company

SOUND EFFECTS added to your home recordings fill in the thin spots in dialogue and action sequences and pep up the listening interest of home-cut disks. Suppose, for example, you wish to reproduce the noise of a thunderstorm, an explosion, or the firing of big guns. It's simple. Pour a teaspoonful of BB shot into a toy balloon, blow it up, and then shake. Talking into a short length of hose sounds exactly like a voice from the depths of a well or cave, or speech coming through the engine-room intercommunications system used on board ships. Talking across the open mouth of a water tumbler gives a good imitation of a voice from the other end of a telephone. Put a straw in a glass of water and blow gently and you have the sound of water boiling. To make rain, pour salt on a piece of tissue paper held so that salt runs over the surface. A man's hatbox and a package of BB shot are the only items needed to create the pounding of surf upon a beach. Empty the shot into the hatbox

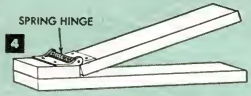
FOR HOME RECORDINGS



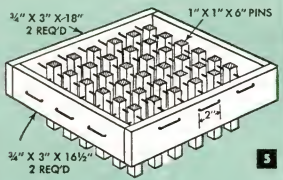
Sound-effects engineers call this a "twang" box. They use it to produce comedy effects



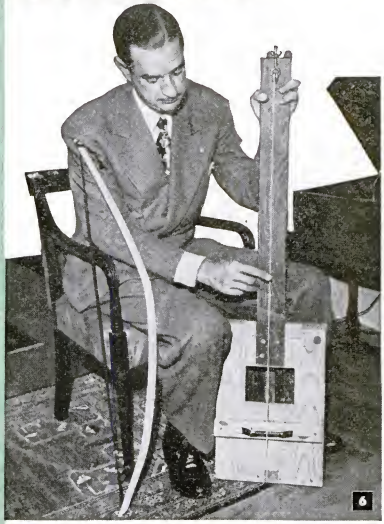
A "squeak" box reproduces the creaking of a ship's rigging, squeaky floors, rusty hinges

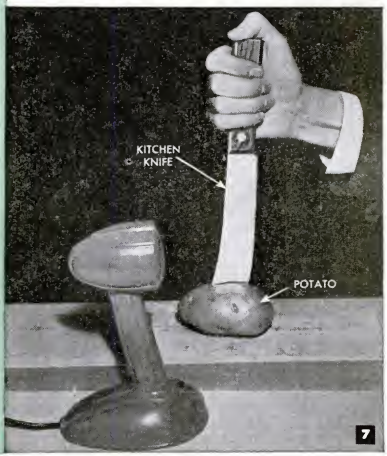


Lift the hinged arm of this device and release suddenly to get the sharp crack of a whip



An arrangement of hardwood pins in a wooden frame makes realistic sound of marching feet





and tilt it slowly from side to side.

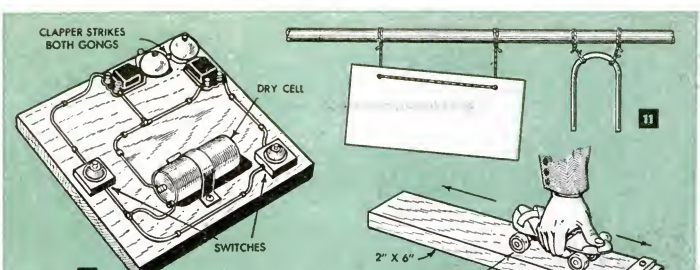
The sound of bells, chimes and gongs is readily reproduced. Hold a large metal fruit bowl by supporting it on the tips of three fingers. By striking it with a drumstick, a rubber-faced mallet, or a small metal hammer, any number of tones such as fire and church bells, a chime clock, and cow and locomotive bells can be reproduced. The unit in Fig. 11 also will reproduce these sounds. It is made from a pipe, a sheet of flat brass and a ¼-in. brass rod bent U-shaped. The units are attached to the pipe with cord in the manner indicated.

Two old-style doorbells of the type that will ring as long as the switch button is held down, plus a dry cell attached to a wooden base as in Fig. 10, will give a number of effects for home recordings. Each bell must have its own push-button switch, and must be arranged so that the clapper of one of the bells will strike both gongs. You'll need this to simulate a telephone ringing, as one bell will not give the correct sound. To portray a riveting machine, dampen the bell by putting your hand on it. A buzzer sound is made by removing the gong or bending the striker arm slightly so that it does not touch the gong.

In Fig. 1 the family "sound engineers" are supporting the script reader with the explosion balloon, squeak box, Fig. 3, and a metal bowl held ready to simulate the bells or chimes effect. For certain comedy sound effects, the studios use what they call a "twang" box, Figs. 2 and 6. You can duplicate it by following the details in Fig. 2. The bow is strung with heavy fishline. By raising and suddenly releasing the spring-hinged arm of the gadget in Fig. 4 you get the sharp crack of a whip. Hardwood pins supported on cords strung in a square wooden frame as in Fig. 5, make the sound of marching feet when you hold the device in both hands and "walk" it across a table top. It is raised and lowered at regular intervals as it is walked along. In Fig. 7 the villain stabs the hero, that is, in effect. The sound-effects man has merely plunged the knife into a potato placed near the mike.

Many effects, such as the opening of doors and desk drawers or starting a car, Fig. 9, are captured by simply holding the microphone close to the actual operation. The sounds made by insects, birds, dogs and chickens are recorded in the same way. The opening of an envelope is "pictured" in sound by tearing a piece of paper close to the mike.

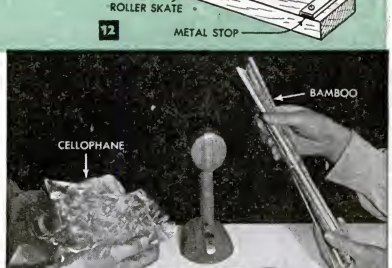
Twisting the ends of two tin cans together gives a good imitation of opening a safe. Machine noises and the clatter of gears can be produced for entertainment purposes by turning an egg beater. Let the blades beat in a pan of water and you have a speeding motorboat. By striking the bottom of a pan with the revolving blades you have a broken-down jalopy struggling along. An electric sewing machine or the kitchen-mixer motor in operation will sound like an elevator going up or down. Push a roller skate along a board, Fig. 12, and stop it suddenly against a metal cleat. This is the opening



and shutting of an elevator door.

The swish of a tennis racket past the mike will record like the swing of a golf club. Let the water from a faucet splash into a pan, and you have a waterfall. For top comedy effects, fill a metal pan with scraps of metal, pipe, bottle caps and washers. Grasp this "crash tub" firmly and shake vigorously. Squirt water from a Seltzer bottle into an empty pail, the stream hitting the side of the pail as in Fig. 8, and you have the sound of someone milking a cow. Use the two halves of a coconut shell to imitate the "clop" of a horse's hoofs, also shown in Fig. 8. Crumple Cellophane in the hands to get the crackle of a camp fire. Fill a bag with cornstarch, then press alternately on the bag with the thumbs and you get the sound of footsteps in snow. A bundle of bamboo splints twisted together gives the sound of a forest fire. All three methods are pictured in Fig. 13. For the sound of a steam locomotive cover the open top of a wooden box with light sheet metal in which rows of holes have been punched with a nail, as in Fig. 14. Using a bundle of wires taped together, brush over the perforations. With a little practice you can simulate the sound of a starting or running locomotive realistically enough to deceive even a practiced ear.

To be useful, such "canned" effects must be put on your record at definite intervals so you can locate them quickly. Leave a place uncut before each sound.



Crush Cellophane slowly or twist a bundle of bamboo splints to simulate fires burning. Fill a bag with cornstarch and press with the thumbs to imitate the sound of footsteps in the snow

Top of this box is covered with sheet metal in which rows of holes have been punched. Brushing the perforated surface with a small bundle of wires gives the sound of a steam locomotive

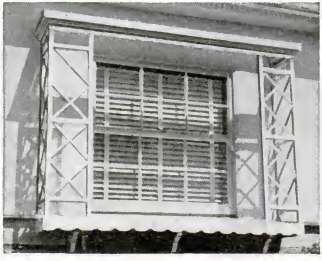
Scoop for Household Use From Plastic Tumbler

Instead of discarding a cracked plastic water tumbler, convert it into a scoop that will be convenient for measuring flour, sugar and other condiments—or you can use it in a darkroom to handle dry chemicals. To make the scoop, cut and sand the cracked tumbler to the approximate shape shown in the detail and drill a hole in the bottom. Then attach a wooden handle by means of a brass screw driven through the hole. Use a brass washer to keep the scoop from pulling off the handle.

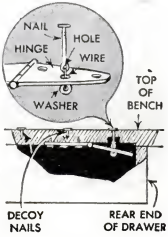
Simon S. Palestrant, New York City.

False "Bay Window" Projection Relieves Plainness of Wall

Here is an attractive and practical way of dressing up a window to relieve plainness of an exterior wall. It consists of a fretwork projection in the form of an open-wall shelf which is designed to hang over a wide window and create the effect of a bay. It forms a perfect setting for a flower box or a row of potted plants and the fretwork ends will give ivy something to cling to. The whole unit is supported at window-sill height by corbels bandsawed from thick stock. Angle brackets are used at the top to attach the unit to the house.



Hinge Serves as Secret Lock On Workbench Drawer

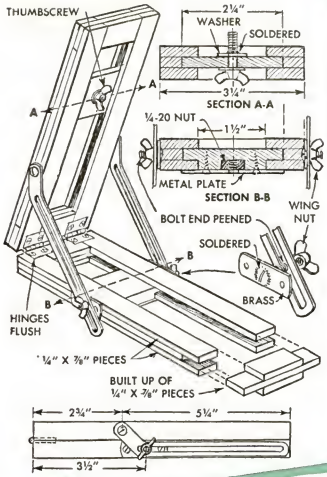


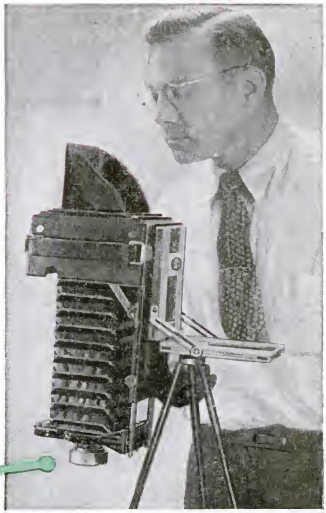
This simple drawer lock defies detection mainly because it is hidden and also because the nail which operates the lock appears to be one of those used to fasten the bench top to the legs. As the detail shows, the lock, consisting of a strap hinge with a nail release pin attached to one leaf, is recessed into the underside of the bench over the drawer. One leaf of the hinge is screwed flush in the recess and the other leaf is left free to swing downward to form a stop, which prevents the drawer from being pulled out. The nail release pin is attached loosely to the hinge with wire and a washer. Should the nail become detached from the hinge, a shallow notch cut in the top of the drawer in line with the hinge at the time the lock is installed, will provide clearance so that the drawer can be withdrawn. Several decoy nails should be driven where shown.

C. L. Meehan, Lakeview, Ont., Can.

Wooden Plug Replaces Screw Cap

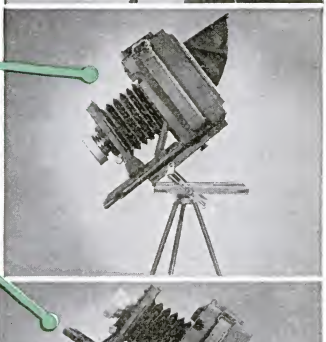
To save time in screwing the cap on and off a soap-paste container, one mechanic replaced the screw cap with a tapered plug turned to fit snugly into the open top. A wooden drawer pull attached with a screw driven through the plug from the bottom serves as a handle for lifting. This same kink can be used on other screw-top containers which are opened and closed frequently.





4 - way TRIPOD HEAD

Adjustable to the positions shown in the photos, this tripod head is provided with a sliding base which permits shifting the camera so the center of weight is over or near the center of the tripod. This means that a fairly heavy camera can be supported firmly on a lightweight head without becoming unbalanced. Follow the details given in the drawing, using birch or maple for the wooden parts and brass hardware, if it is available.—E. Peter Smith, Los Angeles, Calif.



Rep. C.C.B. #141

Apartment DARKROOM

Made to order for apartment dwellers. Has everything but running water—all equipment is stored compactly in a portable, folding cabinet — ready for use

By Walter S. Marsh

IF PHOTO PROCESSING is your hobby, but you're handicapped by lack of a handy place to work, then this self-contained darkroom should make you happy—especially if you live in an apartment. It does away with makeshift methods, saves time normally spent in getting ready and keeps everything together. Just swing open the top and bottom doors, lower the front and you're all set to begin work, with everything at hand, except running water. It folds compactly as shown in Fig. 3 for storing in a corner.

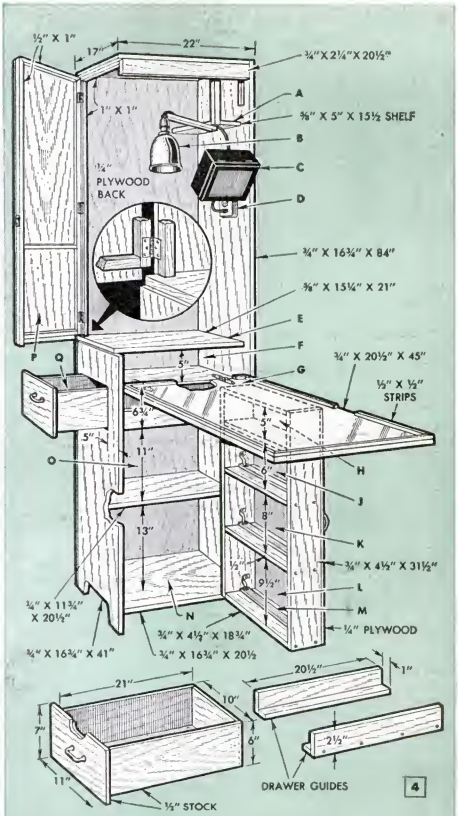
The cabinet is designed with a specific place for each item of equipment and the keyed list and drawing in Fig. 4 shows where each goes. The front of the cabinet, when lowered, provides a roomy worktable, which is supported at a convenient height by swinging open the door below it. The table forms a large working area which will accommodate three 11 by 14-in. trays, side by side, as shown in Fig. 1. A separate block of wood should be at hand to place under the "gate-leg" door to prevent the cabinet from tipping forward. Note that a standard safelight is hinged to illuminate the worktable, and that there is a handy overhead white light that can be swung out over the work. The door which supports the worktable is fitted with shelves for storage of photo chemicals as shown in Fig. 2, with additional space for other supplies in the bottom of the cabinet.

The cabinet is of simple butt-joint construction. As dimensioned in Fig. 4, it is a little over 7 ft. high. Plywood and solid stock can be combined in making it, plywood being used for the back of

3

This shows how compactly cabinet folds. Doors nest flush with sides and are held closed with cupboard friction catches

the cabinet and for facing the two doors. The drawer opening in the side of the lower part can be cut out with a keyhole saw by first boring a ¾ or 1 in. hole in each corner. Notice that the legs of the cabinet are a part of the side, and that the center shelf is narrower than the bottom one to allow for the thickness of the shelf-fitted door. The surface of the worktable can be given two coats of acid-resistant lacquer, or it can be covered with linoleum. The doors are held shut with cupboard-type friction catches. A multiple outlet and extension cord should be installed in the cabinet for plugging in an enlarger and contact printer.



4

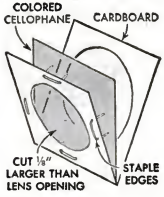
KEY TO EQUIPMENT

A—Shelf for contact printer. B—Swivel white light. C—Safelight (red). D—Electric outlet for enlarger, safelight and white light. E—Shelf for 4 by 5-in. enlarger. F—Tray storage, three 11 by 14-in. and three 8 by 10-in. G—Worktable. H—Dry chemicals, etc. J—Film tanks, graduates, etc. K—Eight pint bottles. L—Six quart bottles. M—Elastic-band straps for holding contents. N—Storage bottles, ½ and 1-gallon size. O—Photofloods, camera, etc. P—Ferrotype tins. Q—Drawer for film, film holders, film-pack adapters, small accessories

Funnel Holds Developing Tank While Being Drained

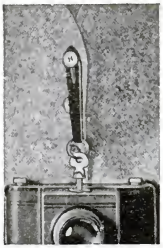
Many plastic developing tanks, because of the light-trap arrangement in the lid, are not easy to drain in a hurry. But by setting the tank in a funnel which has the spout set in the developer or fixer bottle, draining can proceed without any further attention on the part of the photographer. Be sure to select a funnel that has a long spout that fits well into the bottle. This will prevent spillage.

How to Make Set of Lens Filters



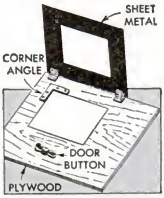
Making a set of filters for a camera requires little more than several sheets of colored Cellophane of the same approximate light intensity and shade as that of regular filters. The Cellophane is placed between two sheets of cardboard cut to fit your filter holder, with the opening cut about ⅛ in. larger than the lens. Staples hold the filter together. Exposure factors for each filter will have to be determined by experiment.

Novel Camera Carrying Strap



Small cameras carried by means of a neck strap may be damaged as they swing outward when the photographer bends forward. With a few odds and ends, it's easy to make a carrying strap that will eliminate this possibility of damage. A key ring is slipped through the loop of an old suspender strap. Then a flat key is cut down and soldered into the slot of a ¼-in. screw that fits the tripod connection. The key ring is fastened to the key, the strap is buttoned to your vest and your camera is carried in a safe manner.

Paper Holder for Enlargements



Having many enlargements of the same size to make, one photographer found this mask a great time saver. The base is plywood and the mask is lightweight, galvanized sheet metal. Cut the mask so that when it lays over the paper, it is about ¼ in. smaller all around. This allows for the border. The corner angle is to position the paper and is located by trial and error. Rivets fasten the mask to the hinges which are screwed to the base. A door button clamps the mask to the board.

Iron Supports Photoflood Lamp

An electric iron makes a substantial, yet easily moved, support for a photoflood lamp used in taking table-top pictures. The clamp-on reflectors commonly used are top heavy and often it's difficult to find a way to set them at the proper height on the table. With this arrangement, the lamp can be moved about with little trouble.

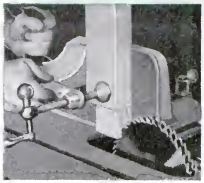
William Swallow, Brooklyn, N. Y.

"Built-In" Thermometer Fits Agitator

Instead of removing the agitator from a film-developing tank to test the temperature, drill a hole lengthwise through it and insert a dial-type thermometer, as shown. Then you can read the temperature of the developer within the tank at any time. The thermometer does not interfere with operation of the agitator.—Kenneth Murray, Colon, Mich.

CRAFT QUIZ

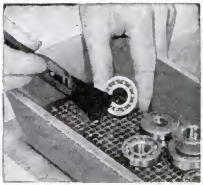
1. He is tightening the—
(a) Jib (c) Compound
(b) Gib (d) Fence



2. He is making double—
(a) Cheek cuts (c) Crosscuts
(b) Shoulder cuts (d) Cut-offs

3. These gadgets are—
(a) Fuses (c) Cleat sockets
(b) Pipe plugs (d) Extension sockets

4. This joint will need a—
(a) Dowel (c) Key
(b) Spline (d) Tenon



5. No fire hazard with—
(a) Gasoline (c) Carbon tet.
(b) Benzol (d) Naphtha

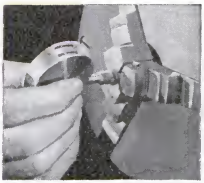
6. This helps in—
(a) Turning (c) Finishing
(b) Sanding (d) Threading

7. Tool holder shown is—
(a) English-type (c) Spring
(b) Turret (d) Box

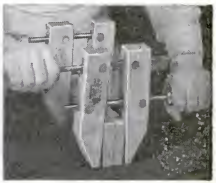
8. Job here is clamped with—
(a) Hand screws (c) Bar clamps
(b) C-clamps (d) Screw boxes

9. Reflector holder made from—
(a) Street els (c) Couplings
(b) Tees (d) Reducers

ANSWERS: 1—b; 2—a; 3—d; 4—b; 5—c (carbon tetrachloride is non-inflammable); 6—a (sawing surplus wood from corners eliminates much rough turning); 7—a (more commonly, open side); 8—a; 9—a (street elbows); 10—b (revolutions per minute); 11—c (jaws should be parallel to clamp work evenly)



10. He is checking the—
(a) F.P.M. (c) C.F.M.
(b) R.P.M. (d) B.H.P.



11. What's wrong?
(a) Hands (c) Jaw alignment
(b) Kind of clamp (d) Clamp position

With this issue, *Popular Mechanics* inaugurates a new reader service to help homemakers solve the hundreds of problems that confront them everyday. The Clinic Editor is waiting to hear from you and, because of limited facilities, asks that you confine your questions to those pertaining to your home—inside or out—and its immediate grounds. Address your questions to The Clinic Editor, Popular Mechanics Magazine, 200 East Ontario Street, Chicago 11, Illinois

Stopping Squeaks in Hardwood Floors

Q—What can I do to eliminate squeaks in hardwood floors?

M.E.L.—Phoenix, Ariz.

A—If you can get at the floor from below, drive short wood screws up through the subfloor into the hardwood floor. Have one or more persons stand on the spot where the squeak occurs and draw up the screws tightly. If you cannot get at the floor from below, try working powdered graphite into the joints of the boards to lubricate the edges. If this does not stop the squeaks, your only recourse is to drive finishing nails at alternate angles through the hardwood floor into the subfloor and then set the nail heads and putty over them.

Relieving Air-Bound Radiators

Q—How can I relieve an air-bound radiator in a gravity hot-water heating system?

G.C.S.—Iron Mountain, Mich.

A—In an upfeed system where the supply rises from below, each radiator should have a valve for air relief. If valves are not installed, air may fill the supply pipe at the point of connection to the radiator and impede circulation. For a down-feed system, in most cases, it is unnecessary to relieve each radiator as air will rise through the supply pipe and accumulate at the high point in the system, where it should be vented.

Wood Stain Discolors Paint

Q—We painted stained-wood trim in our home and the stain is darkening the paint. Can we prevent this trouble?

O. W.—Riverdale, Ill.

A—Likely the stain was an aniline dye, which would bleed through the paint coat. The best remedy is to give the wood a coat of stain sealer, which you can purchase, and then paint it again.

Noise From Furnace Transmitted by Air Ducts

Q—Is there any way to prevent noise from our furnace blower being transmitted through the air ducts to rooms above?

S.M.J.—Syracuse, N.Y.

A—Cut a section about 1 in. wide from the air duct leading from the furnace to the blower unit. Then cover the opening thus made with a strip of heavy canvas, attaching the canvas with a good adhesive and metal bands or clamps. The canvas prevents vibration, which causes the noise, from being transmitted to the furnace casing and then through the air ducts. Also, it may be necessary to cut out a section of the cold-air duct leading to the blower unit.

Soot Streaks on Wall Near Window Trim

Q—Can you tell me what causes soot streaks on the wall near the edges of some of our window casings?

M.E.W.—Mt. Sterling, Ia.

A—The streaks are caused by soot-laden air leaking around your window frames. Caulking around the frames on the outside to prevent entrance of air will stop the trouble, and also reduce fuel costs.

Water Freezes on Porch Steps

Q—Some of our porch steps are worn down in the center so that water accumulates, and in winter freezes. How can I drain them?

J.L.D.—Louisville, Ky.

A—Drill two or three small holes through each step at the lowest point so water can escape.

How to Drill Cork

Q—Can you tell me how to drill clean-cut holes through cork?

J.F.W.—Denver, Colo.

A—Use a metal tube of the same outside diameter as the hole you wish to drill in the cork. Grind or file one end to a sharp bevel. Provide some kind of a handle or grip on the other end so that you can rotate the tube easily as it is pressed into the cork.

Leaks in Oil Tank

Q—A large tank that I use for kerosene has developed two or three small leaks in the bottom. Is there any way to repair them as I am anxious to keep the tank in service?

S.O.R.—Detroit, Mich.

A—Your best bet is to first enlarge the holes where the leaks occur to remove the damaged metal, and then plug them. You can use a small toggle bolt and lead washer for each hole. Insert the toggle end of the bolt into the tank, slip on the lead washer, outside the tank, and back it up with a steel washer of the same diameter. Then turn on a nut and pull it up to squeeze the lead washer tightly against the tank and seal the hole.

Chewing Gum Removed From Upholstery

Q—My youngsters have put chewing gum on the upholstery of a new chair. What will take it out?

U. B. G.—Chicago

A—Moisten the gum with carbon tetrachloride, and while it is still wet, carefully scrape the gum with the edge of a dull knife. Or, hold an ice cube on the gum to harden it. When brittle, the gum can be crumbled and removed.

Shoe Mold Opening Up

Q—The shoe molding around my kitchen is opening up and leaving a crack between it and the linoleum. What is causing this?

A. B. T.—St. Louis, Mo.

A—Improper nailing combined with shrinkage will cause this trouble. See if the molding has been nailed to the baseboard instead of to the flooring. When this is done, the baseboard, in drying out, will pull the molding with it. The remedy is to remove the molding and nail it to the floor.

Softening Hardened Putty

Q—Several of my storm sash need reglazing. Is there something I can apply to loosen the putty?

R. O. B.—Duluth, Minn.

A—Application of a hot soldering iron will usually do the trick. Use a large one for sufficient heat and pass it slowly over the putty. The heat will take the oil from the putty, leaving it in a crumbling state, after which it usually can be removed with a wood chisel or a putty knife.

Wall Openings Improve Space Heater

Q—Can you tell me how to improve warm-air circulation from a space heater to adjoining rooms?

W. H. F.—Rome, N. Y.

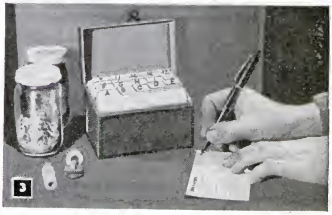
A—One of the best ways to improve circulation of warm air between rooms is to install grille-covered openings in the walls between the rooms. The openings should be at ceiling height and should be long and narrow. A size 10 by 30 in. will do in most cases.

"FIND-IT" SYSTEM for Your Shop

By Walter E. Burton

IF YOU HAVE ever spent a lot of time searching in a multiple-drawer shop cabinet for some item badly needed at the moment, then you can appreciate the efficiency and speed of this simple shop-filing system. It is set up for a cabinet with any number of drawers, or it can be used with a number of small boxes, glass jars or other individual containers, to store such items as bolts, nuts, washers, screws, steel wool, felt, small tools, radio parts, etc. The same system will serve when filing photo negatives or newspaper clippings in envelopes.

In setting up the filing system for items stored in a cabinet, first number each drawer 1, 2, 3 and so on, as in Fig. 2. Numbers are painted on the drawers free-hand, or applied with a stencil or rubber stamp. Proceed the same way in numbering other containers used in place of cabinet drawers. Each drawer of a storage cabinet may contain several different kinds of objects. Where this is so, it will be still handier to place each group of small articles, washers, nuts and the like, in a separate container which is placed in the drawer along with others containing other small parts. Then prepare an index with 3 by 5-in. cards and



file case such as that shown in the photo at the left of Fig. 1. List all items in each drawer on separate cards, Fig. 3, and file under the correct index letter, as washers, wire, worm gears, under "W," and so on through the alphabet. Place all these items listed under "W" in one drawer. In many cases it is possible to label the container or object with the number of the drawer it is kept in as in Figs. 1 and 4. In this way a container or part which has been taken from the drawer to the bench may be returned to the same drawer without consulting the index to determine its proper place.

Filling-Station Attendant Carries Map for Customer's Convenience

As a special service for customers, attendants at one filling station carry road maps hooked to their belts for ready reference. This makes it unnecessary for the driver to get out of his car and go into the station to check his route or obtain other road information. The map is glued to a plywood panel, being folded so that one-half of the map is on each side. A sheet of Cellophane covers the map and panel, and the edges are bound with tape.

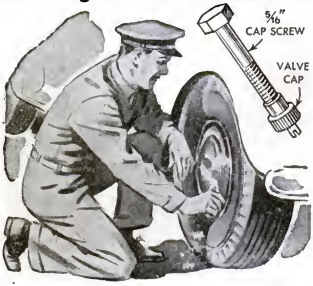
Wood on Ferrule Improves Brush

For those who use small brushes when lettering, striping and filling, plastic wood molded around the ferrule of the brush makes it easier to handle. After the wood is applied to the brush, allow it to dry and sandpaper to a smooth finish. Advantages of the larger grip are: It's easier to pick up, and permits a firmer hold on the brush.

Valve-Cap "Tool" Handy When Removing Auto-Tire Valve Core

Tires on many cars do not have valve caps with a core-removing stem and, for that reason, one filling-station attendant made this tool, which he carries in a pocket, to remove valve cores. It consists of a 5/16-in. hexagon-headed cap screw turned tightly into a valve cap of the correct type. Additional purchase afforded by the head of the screw makes it easy to loosen cores that are "frozen" in the stem.

Lincoln U. Glos, Maywood, Ill.

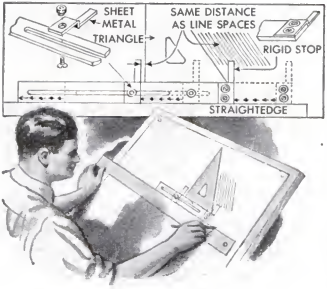


¶Clean holes with a minimum of tearing in using an ordinary twist drill can be obtained by sharpening the drill to an included angle of 135 degrees and operating the drill at a fairly high speed.

Blowtorch Heats This High-Temperature Furnace

Made from two coffee cans lined with refractory cement, and fired by an ordinary blowtorch, this high-temperature furnace will melt aluminum, sterling silver and other alloys having melting points in the same range. First, cut a 1¼-in.-dia. hole in the side of one can at a point about midway between the top and bottom. Mix ground firebrick, 1 part, and fire clay, 1 part, with enough water to make a thick paste. Cover the bottom of the can with this mixture to a depth of 1 in. and allow it to harden. Then cut a 2½-in.-dia. cardboard tube to about 4 in. long; also cut a 1¼-in. hole in the tube at the same height as the hole in the can. Center the tube in the can with the hole in the side in alignment with that in the can. Insert a short length of broomstick through the two holes. Then fill the space around the tube with the cement mixture and tamp down as in the photo above, left. Withdraw the broomstick piece and the cardboard form before the cement hardens. Proceed in the same way in lining the top or cover, except that no hole is cut in the can or the cardboard form. After the cement has hardened, place a small glass tumbler, 2-in. dia., inside the bottom can. Pack the space around the tumbler with a fire-clay mixture. This gives a smooth lining. Do the same with the top, or cover can. Withdraw the tumbler before the cement hardens. Drill a ½-in. hole through the bottom of the cover can and through the refractory lining. This will vent pressure from the torch flame. Set up the furnace as in the photo at the right, place metal to be melted in a small clay crucible and set it in the bottom half of the furnace. The nozzle of the torch should be about ¾ in. from the fire hole for best results.

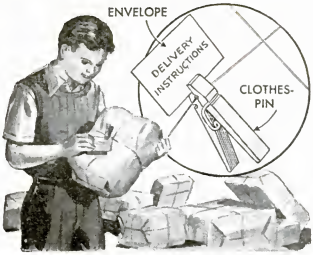
Martin O. Koehler, River Grove, Ill.



Crosshatch Lines Spaced Uniformly When Drawing Guide Is Used

To space crosshatched lines evenly, and to avoid undue eyestrain, one draftsman uses this line guide. It consists of a straightedge to which one rigid or fixed and one movable stop are attached. The right-hand stop is fastened by two bolts, as shown in the detail, and the left-hand stop slides in a slot. To use the guide, place the triangle against the rigid stop and set the movable stop the width of one crosshatch space away from the vertical leg of the triangle. Draw a line; place the triangle against the movable stop and, holding it, slide the straightedge to the left until the fixed stop touches the triangle. Then repeat as before.

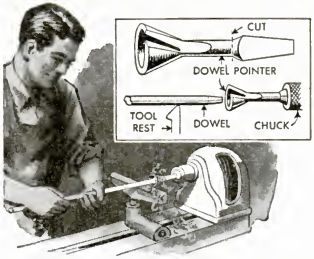
Clothespin Holds Instructions For Delivery of Package



To avoid mixups in deliveries, one merchant places the instructions in an envelope and clips it to the package with a spring-type clothespin. The pins are painted in bright colors, each color being for a certain driver. After delivery the pins are returned to the shipping room to be used again.—Wm. P. Houser, Organ, N. Mex.

Dowel Pointer Chucked in Lathe Sharpens Work Quickly

By cutting the square shank off a dowel pointer and inserting it in a lathe chuck, I was able to chamfer both ends of over 1000



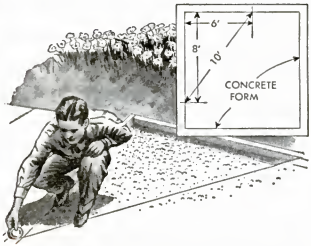
dowels in an hour. The tool rest is adjusted so that the work, when supported on it, is on a level with the center of the pointer.
Samuel Silberman, New York City.

Keeping Hands Warm Outdoors

Trappers and ice fishermen who find it necessary to submerge their hands in cold water to set traps and rig lines can keep their hands free from chapping during cold weather by rubbing them with olive oil. The coating of oil will keep the hands almost as warm as a pair of gloves.

How to Square Concrete Forms By Using Steel Tape

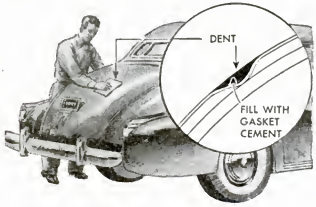
Here's a quick way to check a concrete form with a steel tape and determine whether or not the corners are square: Measure a distance of 6 ft. from one corner along the side and, from the same corner, measure 8 ft. along the joining side. Mark these two points and determine the length of the hypotenuse of the triangle thus formed. This should be a distance of 10 ft. If the form that you are checking is too



small for these distances, they can be halved; that is, measuring 3 ft. on one side and 4 ft. on the other will result in a triangle having a hypotenuse of 5 ft. On forms that are extremely large, double the dimensions for an accurate check.

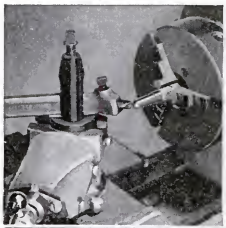
Body Dents in Car Are Repaired With Gasket Cement

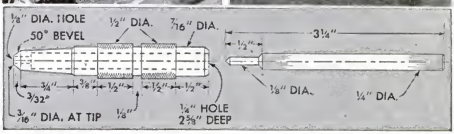
For a quick and inexpensive way to repair small, shallow dents in a car, try using gasket cement. First fill the dent and allow the cement to harden. Then sand the filled part flush with the surrounding metal. Finally, paint the repaired area the same color as the adjacent finish.



Self-Centering Punch Marks Screw Holes To Mount Builders' Hardware Correctly

Here is a self-centering punch for marking countersunk holes in hinges, locks, brackets and other builders' hardware. The punch consists of a sleeve or barrel with a beveled tip that fits into the countersink, and a pointed member, which slides in the barrel and makes the mark for the screw in the exact center of the hole. This eliminates inaccurate sighting by eye, which is done when an ordinary punch or a pencil is used. The sleeve is turned from a piece of ½-in. cold-rolled steel approximately 2⅞ in. long, which is drilled as shown, and beveled at a 50-deg. angle. All necessary dimensions for turning it are given in the detail. For the "point," use ¼-in. drill rod for best results. Note that the dimensions given are for a punch that will be a convenient size for ordinary hardware; for smaller work, reduce the dimensions proportionately.





Disinfectant Pad on Barn-Door Sill Provides Sanitary Protection

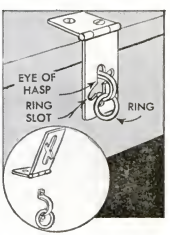
To aid in keeping a dairy barn or poultry house sanitary, provide a disinfectant pad at the door to be used as a "foot mat." This will serve to prevent the spread of germs. The pad consists of a shallow box or tray in which burlap bags are placed. The cloth is kept thoroughly saturated with disinfectant solution. Persons entering the barn or poultry house make it a practice to clean their shoes on the pad.

Test for Small Leaks in Soldering

Testing a soldered hole for a leak is easy if a small rubber vacuum cup is available. Moisten the edge of the cup and press it over the hole. If there are no leaks, the cup will stay firmly in place, but if there are leaks, air will get under the cup and it will come off. Of course, the surface around the soldered hole must be smooth. This is a handy way to test tanks, and large pans where it would be difficult to fill them with water.—John Lawrence, Bristow, Okla.

"Ring Lock" Holds Toolbox Hasp

It is not necessary to padlock a toolbox to keep the lid from coming open when carrying the box around on a job. A "lock" that will keep the hasp closed is made by cutting a transverse slot at a slight angle to the hasp slot or eye and then fitting the staple with a ring. Make the slot just large enough to clear the ring easily. To open or close the hasp, align the ring with the slot.



Starter Switch . . . STARTS THE LAMP AND DOES NO FURTHER WORK IN ACTUAL OPERATION. PHOTO SHOWS SWITCH REMOVED—LAMP REMAINS LIGHTED

How to Service FLUORESCENT

By Sam Brown

End Blackening . . . IS A NORMAL DEVELOPMENT OCCURRING LATE IN LIFE OF TUBE

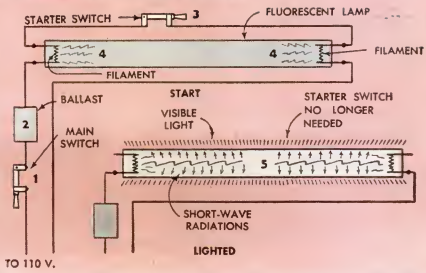
BALLAST, tube and starter switch—these are the three units requiring service in fluorescent lighting installations. Since the ballast is more or less trouble-free, common servicing is simply a matter of replacing a burned-out tube or defective starter.

The tube: Both ends of the tube are alike, Fig. 4. The electrode or filament furnishes a terminal for the arc and originally is covered with an electron-emissive material. This is dissipated during the life of the lamp and is deposited inside the tube, causing the familiar end blackening, Fig. 3, which is a fair index of the "life expectancy" of the lamp. Early end blackening indicates faulty starting.

Starter switch: Following the lamp diagram below, it can be seen that when the starter switch is closed, power is supplied to the tube

How the Fluorescent Lamp Works

MAIN SWITCH 1, IS TURNED ON. BALLAST 2, LIMITS CURRENT TO AMOUNT REQUIRED BY LAMP. STARTER SWITCH 3, IS CLOSED (USUALLY AUTOMATIC) TO COMPLETE CIRCUIT. LAMP FILAMENTS BECOME HEATED AND SEND OUT ELECTRONS 4, AND IN A FEW SECONDS THE ARC 5, STRIKES. STARTER SWITCH THEN IS OPENED AUTOMATICALLY OR MANUALLY AND PLAYS NO FURTHER PART IN OPERATION. ARC 5, SENDS OUT SHORT-WAVE, INVISIBLE LIGHT, WHICH ACTIVATES FLUORESCENT COATING ON INSIDE OF TUBE CAUSING IT TO GLOW AND PRODUCE VISIBLE LIGHT.



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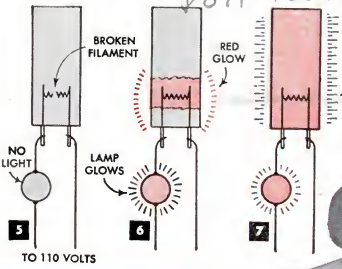
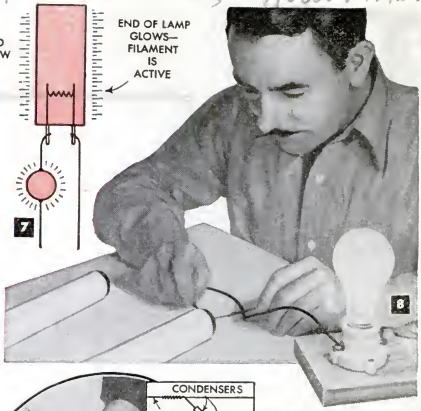
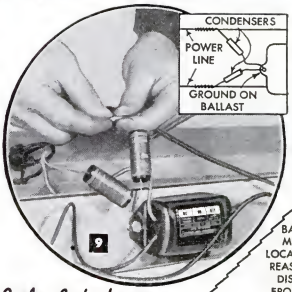
DO-IT-YOURSELF #5 "HOUSEWIRING"





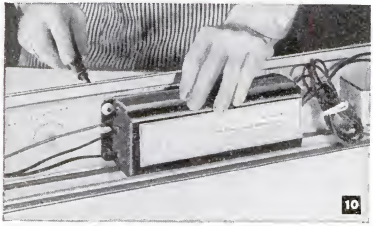
LAMPS

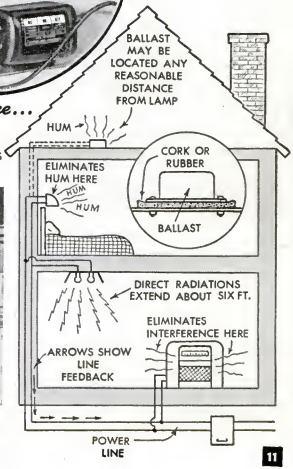
filaments, and they heat and become a dull red. Modern fixtures are fitted with an automatic starter, commonest of which is the glow lamp, Fig. 2. When the fluorescent fixture is turned on, the glow switch receives a full supply of current, causing the movable metal strip to heat and make contact. When the arc strikes, voltage to the glow switch is lowered and the metal strip cools and opens the circuit. Because the glow switch must heat on a certain voltage and not heat on a slightly lower voltage, it is impractical to test the



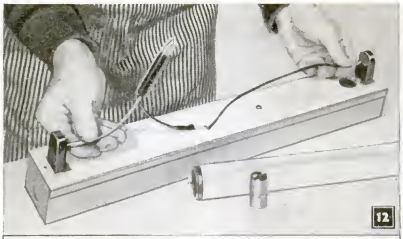
Testing Lamps . . . . IS DONE BY USING A TEST LAMP AS SHOWN. THE PROPER SIZE TEST LAMP MUST BE USED.

Radio Interference . . . IF PRESENT, CAN BE HELD TO A MINIMUM BY HOOKING A SMALL CONDENSER ACROSS THE POWER LINE





Ballast Hum . . . USUALLY IS LOW AND INAUDIBLE UNDER AVERAGE CONDITIONS. BALLAST CAN BE INSULATED TO MINIMIZE HUM, OR IT CAN BE LOCATED SOME DISTANCE FROM LAMP



12

Circuit Testing . . . CAN BE DONE WITH A TEST LAMP. ONE SIDE OF EACH SOCKET SHOULD BE ALIVE AND LIGHT SHOULD SHOW BETWEEN THEM.

13

switch electrically by any method other than placing it in the fixture.

Lamp blinking: Near the end of life, the electron-emissive deposit on tube filaments is exhausted, the filaments are no longer self-sustaining and a cycle of blinking continues until either lamp or starter ceases to function. To prevent blinking, auxiliary equipment was added to the glow switch, making a double switch, the second switch turning off the first when the fixture is not functioning correctly.

Testing lamps: Use an extension cord with the ends scraped clean. Connect a socket in one of the power lines, as in Figs. 5 to 8 inclusive. When the test wires are touched to the prongs of the tube, the test lamp should light. If it does not, a broken filament is usually indicated.

14 **FLUORESCENT-LAMP, TROUBLE-SHOOTING CHART**

FAULT	POSSIBLE CAUSE	REMEDY
LAMP BLINKS (This fault should be corrected at once to avoid undue wear on lamp and starter)	END OF LIFE (Normal life is 2500 hours)	INSTALL NEW LAMP
	DEFECTIVE STARTER	TEST WITH NEW STARTER
	LOOSE CONTACTS	CHECK CONTACTS AT LAMP ENDS
	WITH NEW LAMP: MAY BE CAUSED BY DEFECTIVE LAMP	CHECK WITH A LAMP KNOWN TO BE SATISFACTORY
	WITH PLUG-IN FIXTURES: LOOSE CONNECTION AT PLUG	CHECK PLUG. TRY NEW PLUG-IN. TEST FROM DIFFERENT OUTLET
POOR OR SLOW START	USUALLY DEFECTIVE STARTER	REPLACE STARTER
	COLD WEATHER (Fluorescent lamps are unsatisfactory below 50° F.)	SHIELD LAMP (A special lamp for low-temperature operation is available)
NO START	LAMP OR STARTER OR CIRCUIT DEFECTIVE	CHECK LAMP, STARTER AND CIRCUIT IN ORDER NAMED
ENDS OF LAMP REMAIN LIGHTED	DEFECTIVE STARTER	REPLACE STARTER
BALLAST HUM	NORMAL. MOST PRONOUNCED IN CHEAP SINGLE-LAMP BALLAST	INSULATE WITH RUBBER BASE. TIGHTEN SCREWS. BE SURE BALLAST HAS SOME MEANS OF VENTILATION. (See also Fig. 11)
RADIO INTERFERENCE	DIRECT RADIATION FROM LAMP OR LINE FEEDBACK	MOVE RADIO AWAY FROM LAMP. CONNECT CONDENSER ACROSS POWER LINE
STROBOSCOPIC EFFECT	NORMAL TO SOME EXTENT WITH ALL SINGLE-LAMP BALLASTS	REPLACE FIXTURE WITH TWO-LAMP UNIT USING TWO-LAMP BALLAST
	MOST PRONOUNCED WITH BLUE AND DAYLIGHT LAMPS	CHANGE TO WHITE LAMPS
FLICKER OR SWIRL	NORMAL, ESPECIALLY WHEN LAMP IS FIRST USED, BUT MAY OCCUR AT ANY TIME	SWITCH LAMP ON OR OFF A FEW TIMES OR LET IT ALONE AND IT WILL CLEAR UP ITSELF
DECREASE IN LIGHT OUTPUT	LIGHT OUTPUT DURING FIRST 100 HRS. IS ABOVE NORMAL	LAMPS ARE RATED AT 100 HR. VALUE (About 10% above normal)
	COLD WEATHER. A LIGHT LOSS OF ABOUT 1% PER DEGREE BELOW 65° F.	ENCLOSE OR PROTECT LAMP. USE SPECIAL COLD-WEATHER LAMP
END BLACKENING	NORMAL NEAR END OF LIFE. CAUSED BY BURNING OF COATING ON FILAMENT	IF OCCURRING EARLY IN LIFE, CAREFUL CHECK OF ENTIRE FIXTURE SHOULD BE MADE

If the tube glows red, Fig. 6, the filament is operating correctly but the activating material has been burned off. When the lamp lights and the end of the tube glows, Fig. 7, that end of the tube is good. If both ends test, the tube is satisfactory. For accurate results, and also to avoid overloading the tube filament, the test lamp should be 60 watts for 14, 15, 20 and 30-w. tubes. Use a 100-w. test lamp for 40-w. tube; 20-w. test lamp for 65 and 100-w. tubes; 25-w. test lamp for the small miniature tubes.

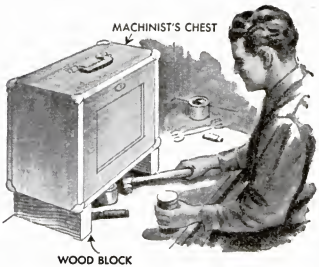
Radio interference: Direct radiation from the tube is eliminated easily by simply moving the lamp or radio. Line feedback can be cut to a very low level by connecting a small condenser across the line, Fig. 9. Special condensers are made for this purpose. Ground the free end of each condenser to some part of the fixture.

Ballast hum: Correction for ballast hum often is made by simply tightening loose screws holding the ballast, as shown in Fig. 10. A rubber shim under the ballast, Fig. 11, will give a more positive reduction of noise. For complete elimination of noise, the ballast can be moved any reasonable distance from the lamp without affecting its performance, Fig. 11. As a general rule, keep ballast within 50 ft. of lamp, avoid damp locations and air temperatures of 120 deg. F. and above.

Circuit testing: If both lamp and starter check correctly, the fault is in the circuit. Test with an electrical tester or a 220-v., 100-w. lamp, as shown in Fig. 12. If the test lamp does not light, the fault is farther along the line and the whole wiring system must be systematically checked.

Power factor: This means that the line must carry an over-supply of current in order to transmit a smaller amount of current which is actually used. Thus, if a ballast requires twice as much current in the line as it actually uses, it has a low power factor of 50 percent. Power factor does not affect lamp performance. Its only effect is that heavier wiring is needed.

Stroboscopic effect: This should not be confused with an actual flicker or blink. Stroboscopic effect shows itself on moving machinery, where, when the moving part and the lamp cycle happen to be timed just right, rotating parts may appear to stand still or to rotate backwards. The highest correction is obtained by using two lamps arranged so that one is "off" while the other is "on." However, a two-lamp fixture is not insurance against stroboscopic effect. Many two-lamp fixtures are two single lamps, each with separate ballast, Fig. 13. Current surge of each lamp is the same. Stroboscopic correction is made only with a two-lamp high power-factor ballast.



Machinist's Chest Set on Blocks Provides More Bench Space

Machinists and mechanics can gain extra bench space by setting their tool chests on two wood blocks placed under the ends. Lengths of 2 by 4-in. stock will do well for this purpose. The space gained can be used for tools or parts, or for the tool-chest cover.—Edmund L. Johnson, Pittsburgh, Pa.

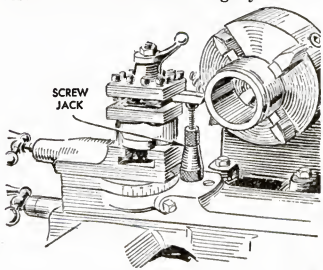
Ball-Point Pen as Stencil Stylus

Ball-point pens now on the market will serve a dual purpose when used as a stylus for duplicating stencils. Results obtained are comparable with that of the regular stylus. The pens' writing efficiency is not impaired and it is not necessary to remove the ink magazine from the pen.

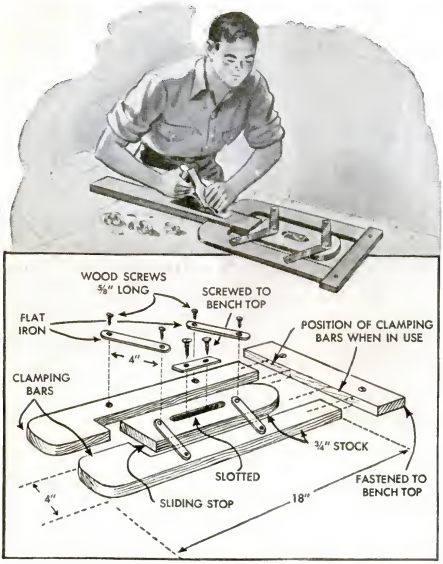
Waldo T. Boyd, West Des Moines, Iowa.

Screw Jack Supports Tool Bit

When a lathe job requires that the tool bit extend so far from the holder that it may chatter or break, a small screw jack will support the bit and keep it steady. The base of the jack rests on the cross slide. With this arrangement, wear on the tool is lessened because it is held rigidly.



Bench Stop With Clamping-Bar Members Has "Gripping" Action When Holding Work



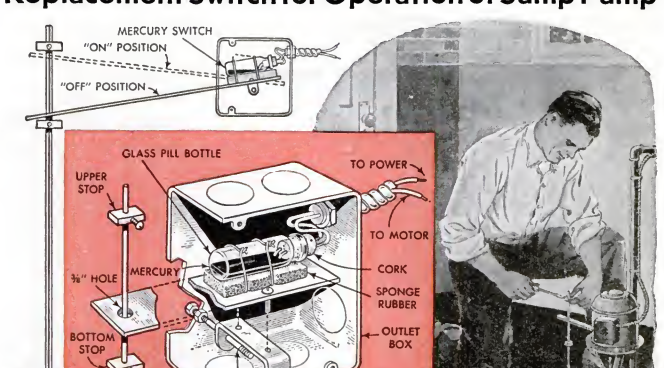
Made from two clamping bars, a sliding member or stop and a fixed piece, this bench stop adjusts itself automatically to various widths, and holds the work in a vise-like grip. Only a few general dimensions are given; the others can be determined by the size of the work to be handled. Remember that the length of the flat-iron pieces to which the clamping bars pivot, will determine the width of boards that the stop will take. After the bars and sliding member have been cut out of ¾-in. hardwood stock, assemble them as shown in the detail, fastening the pivots to the bars and the stop with wood screws ⅝ in. long. Then fasten the fixed piece in place and determine the position of the sliding stop. When this is located, screw it in place using flat-headed wood screws and a length of flat iron drilled for the screws. Since the unit is fastened to the workbench by only four screws, it is removed easily if additional space is required.

"Wood-Cutting" Hardware Display Promotes Sale of Tools

This simple attention-getter is more likely to promote interest and stimulate sales of tools than merely placing the tools in the window in the ordinary manner. To show the superior quality of his planes, knives and chisels, one hardware merchant displayed them on a wooden board or panel with shavings curling up from the blades of the tools. The shavings are strips of brown wrapping paper fastened to the panel near the blade of the tool to look as though cut from the wood. Brown paper tape, if wide enough, can be used instead of wrapping paper. Curl the paper so the shavings will look realistic.

Frequently map pins are difficult to remove because they are hard to grip. If the rubber bulb from a medicine dropper is slipped over the head of the pin, it will be easy to remove.

Replacement Switch for Operation of Sump Pump



Relatively few parts are required for this mercury-operated sump-pump switch and, once installed and adjusted, it should give long and trouble-free service. Heart of the unit is a glass bottle or tube partially filled with mercury which, when tilted in one direction, covers the switch leads to close the circuit to the motor and, when tilted in the opposite direction, uncovers the leads and opens the circuit. The switch is installed in an electrical outlet box. A hole is drilled in one end for the armored cable that conducts the leads to the mercury tube. Then a hole is made in each side of the switch box for the cradle bolt, see detail. The actual switch assembly consists of a glass pill bottle and cork, a sponge-rubber "bed" to which the bottle is wired, a lever that extends through a hole cut in one end of the case and slips over the float rod, and a cradle and cradle bolt. Refer to the detail for the method of assembly of the various parts. No dimensions are given as these will vary according to the material on hand. Note the manner in which the leads are brought into the tube through the cork and bent downward. Remember that the cork must seal the bottle tightly. The amount of mercury in the tube is determined by experiment after the switch is assembled. Keep the cradle bolt tight enough so that, while the bottom stop on the float rod can push the lever up, it will remain in this position until the upper stop starts to pull it down. Care should be taken when assembling and testing the unit to make sure that the switch makes and breaks without arcing. For convenience, mount the box on the motor housing.

Dwight A. Williamson, Glen Ellyn, Ill.

Voltage Drop in Automobile Headlight Circuit Located by Using Test Prod

If headlights on a car are dim, even when the battery is fully charged, and it is suspected that there is a voltage drop somewhere in the lighting circuit, here's one way to locate the possible source of trouble: Make a testing instrument by attaching a battery clip to one end of a length of No. 14 insulated wire and a test prod to the other end. When it is dark—or in a darkened space—turn the lights on a screen or white wall. Fasten the clip to the positive terminal and force the prod through the insulation at a point near the light. If the light becomes noticeably brighter, the voltage loss is probably in a switch, which may need replacing. If the lights remain dim, the ground circuit or the headlight connections may be the cause of the trouble and should be checked.

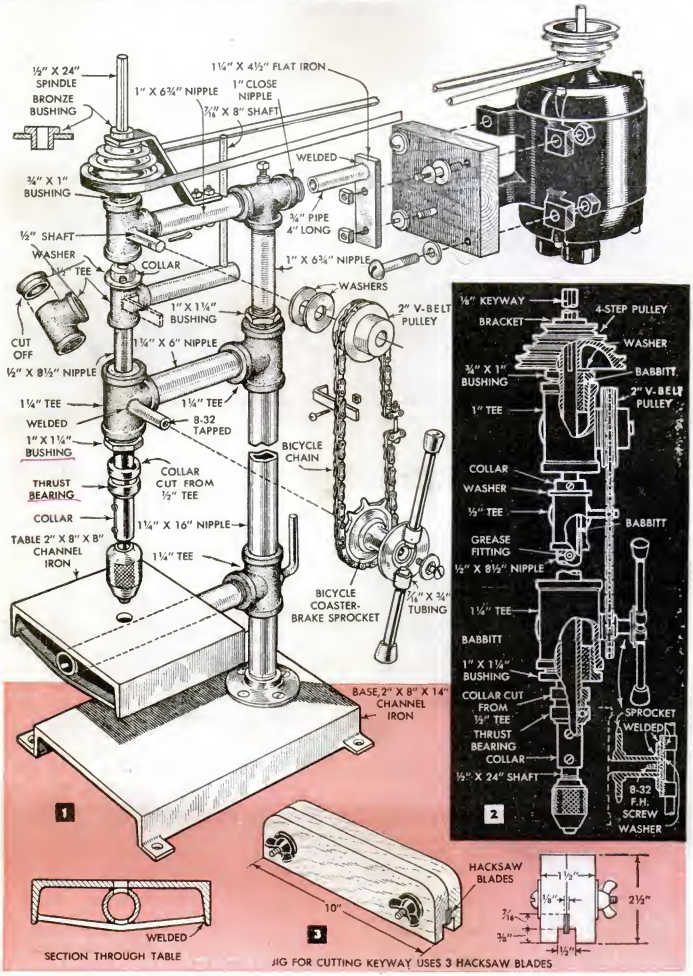
Hal Geihm, Aurora, Ill.

¶ When chipping carbon off a cylinder block or piston, always wear safety goggles to protect your eyes.

Similar one in Plans Cat

REPRINT 60 Power Tools

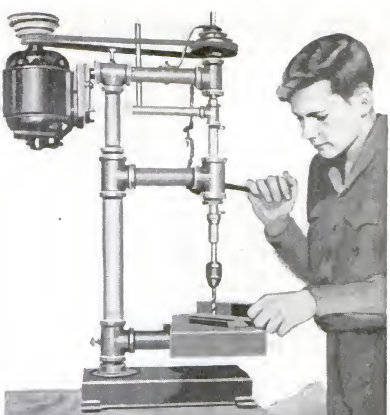
DRILL PRESS MADE FROM PIPE



FITTINGS

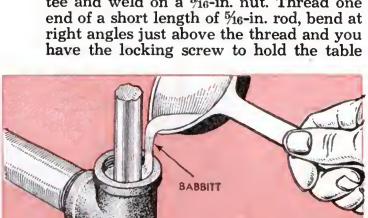
A practical tool for minimum outlay of time and money—that's the main feature of this 15-in. drill press made from pipe fittings

By James L. LeSuer



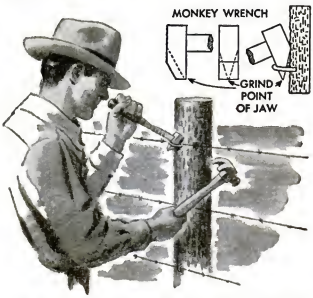
INEXPENSIVE and easy to assemble, this bench-type drill press is made mainly from pipe fittings. The hand-feed arrangement is simple and sensitive in action, giving a positive spindle feed which prevents breakage of small drills. Drill-press accessories driven by a ½-in. chuck, such as router bits, plug cutters, planer heads and disk sanders, can be used.

Fig. 1 details the assembly of the column and head and names the fittings used. First make the base, which is simply a piece of 8-in. channel iron cut to the length given, with four bolt lugs welded to the legs of the channel. While you are at it, make up the drill table also. For the column, use a 16-in. black-pipe nipple. This is easier to polish than galvanized pipe. Place the nipple in a vise and polish smooth with a strip of abrasive cloth. Grasp the abrasive strip at each end and loop it once about the pipe. Then pull alternately on the ends of the strip. Ream the 1¼-in. pipe tee, on which the table swivels, to an easy fit over the column. Drill a 5/16-in. hole through the top of the tee and weld on a 5/16-in. nut. Thread one end of a short length of 5/16-in. rod, bend at right angles just above the thread and you have the locking screw to hold the table securely in any position on the column.



Build up the column and arms, beginning with a 1¼-in. floor flange attached to the base with four 5/16-in. flat-headed cap screws, finishing this part of the assembly with all nipples, bushings, and all tees except those two which will form bearings for the spindle. Draw all joints tight. Weld ½-in. shafts to the bearing tees for the sprocket and idler pulley of the raising-and-lowering mechanism, Fig. 1. Then screw the tees onto the nipples and line them up. Fig. 2 details the spindle assembly. As indicated in Fig. 1 the spindle is 24 in. long and the first operation on it is cutting a ⅛-in. keyway extending from the top of the spindle to the bottom of the 4-step pulley, Fig. 2. Have this milled at the local machine shop or do it by hand with the improvised keyway cutter detailed in Fig. 3. Thread the lower end of the spindle to take the tapped mounting sleeve of a ½-in. chuck. By checking the spindle assembly in Figs. 1 and 2 you can see the sequence of operations necessary to put the parts together correctly. Because the supporting parts are made from pipe fittings, it is impossible to give precise dimensions for the location of bearings, collars and guides. This must be worked out by trial assembly. Fig. 4 shows how the babbitt bearings are poured, using a counterbored wooden block as a retainer.

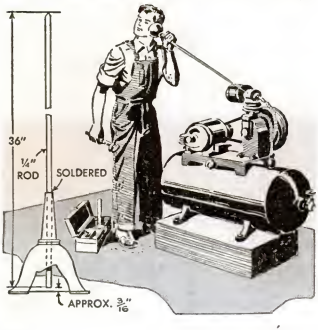
Modified Monkey-Wrench Head Serves as Staple Puller



A monkey wrench that has the movable jaw broken can be converted into a very serviceable staple puller. Remove the broken jaw and grind the head of the other jaw to a beveled point. In use, the pointed jaw is held against the post and the point is forced through the staple with a hammer. The wrench lifts out the staple.

"Stethoscope" Detects Faulty Valves And Knocks in Machinery

To check valve action and locate knocks in compressors, pumps and engines, this "stethoscope" will be a definite aid because it magnifies sound and enables the operator to keep away from moving parts of the machinery while listening. The instrument is made by inserting a ¼-in. rod about 36 in. long in the spout of an oilcan and soldering it in place. Note that the end of the rod clears the bottom of the can, which acts as a diaphragm, by about 3/16 in. To locate a knock, move the tip of the rod about until the noise reaches its greatest intensity. To check valve action, listen for distinct, clicking sounds that will indicate proper opening and closing.

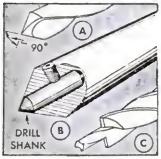


"Gun" Clears Plugged Grease Duct

Plugged grease ducts on autos, farm machinery and other equipment having standard ⅛-in. pressure fittings can be cleared easily by using this plunger gun. It consists of a ⅛ by 6-in. length of threaded pipe, a ¼-in. cold-rolled rod and a piece of cloth to serve as wadding. To use the gun, remove the fitting from the plugged duct and screw the pipe in its place. Pack grease in the pipe, insert the cloth wadding and, using the rod as a plunger, drive the grease through the duct with light hammer blows. This will dislodge dried or stuck particles and clear the duct. Be careful not to drive the cloth into the duct and go easy with any bearing fitted with grease seals.

Wm. Riederich, Elmhurst, Ill.

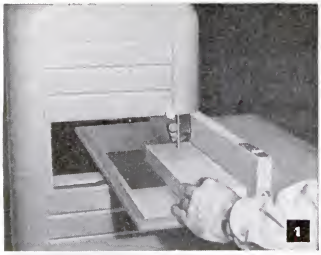
Uses for Discarded Drills



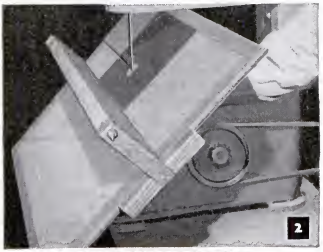
Instead of throwing away worn drills, put them to some other use about the shop. For example, by grinding a short drill to approximately a 90-deg. angle and then grinding the web at the point for penetration, you will have a good starting drill for lathe work, as shown at A. Fitted into a lathe center, as in detail B, a drill shank made of high-speed steel will outwear some ordinary center points. It may be necessary to use a socket-head setscrew to hold the point in place. Still a third use, detail C, is as a counterbore. It should be ground with a pilot as indicated. Be sure to back off the cutting edges for clearance.

Before cutting linoleum, score the line to be cut with an ice pick or scratch awl. This mark serves as a guide for the knife and keeps it from slipping.

Fence and Table Extension Improve Bandsaw

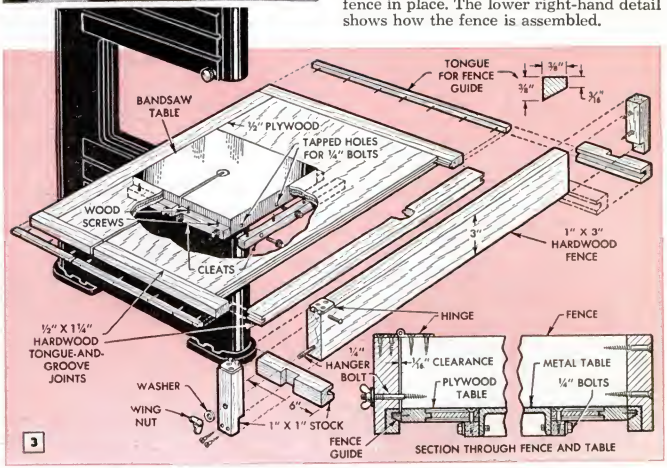


The photos above and below show the bandsaw-table extension being used for straight and bevel cuts

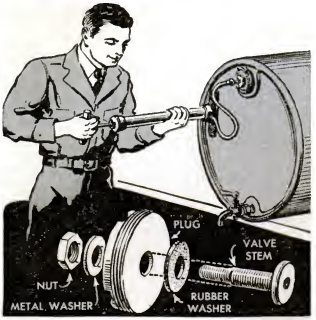


By Edward R. Lucas

An enlarged working area and provision for a long rip fence are advantages of this bandsaw-table extension. The fence is shown in use in Fig. 1, and Fig. 2 shows the table tilted for a bevel cut. Because sizes of bandsaw tables and throats vary, no overall dimensions are given as the extension must be made to suit the saw being used. Fig. 3 shows how the parts are cut and assembled. The table extension consists of a piece of plywood having edges faced with solid stock. These are tongue-and-groove joints glued flush with the surface of the plywood. The opening for the bandsaw table is jigsawed for a snug fit. Four cleats are screwed around the opening on the underside and holes are drilled in them for ¼-in. bolts. Matching holes are drilled and tapped in the sides of the bandsaw table, and the extension is attached to the table with bolts through these holes. Next, add the beveled guide rails for the rip fence and cut the slot for the saw blade, being sure that it is aligned with the slot in the metal table. The rip fence is detailed in Fig. 3. Note that the guide blocks are grooved to fit the guide rails and attached to the end pieces by half-lapped joints. Then one end piece is screwed to the fence and the other is hinged and drilled for a hanger bolt and wing nut for clamping the fence in place. The lower right-hand detail shows how the fence is assembled.



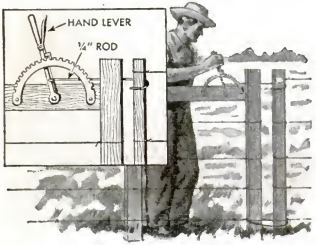
Pump Puts Air Pressure on Barrel To Speed Flow of Oil



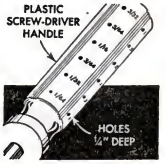
Lubricating oils and other heavy fluids stored in barrels or drums kept in unheated rooms are apt to flow sluggishly during cold weather. To overcome this, remove the barrel plug and drill it to take the valve stem and core from an automobile inner tube. Slip a rubber washer over the stem and insert the latter in the plug, securing it with a metal washer and nut. After screwing the assembly into the drum, put air pressure on the barrel by using an automobile or bicycle hand pump. This will speed the flow of oil from the spigot. If an air hose is used instead of a hand pump, be sure not to put too much pressure on the barrel.—Jerry Pokorny, Kewanna, Ind.

Latch Operated By Lever Keeps Wire Gate Taut

Desiring a means of keeping a fence-wire gate taut, one farmer hit upon the idea of using a discarded implement lever and quadrant as a latch. He attached a hook to the lever and mounted both parts on a board nailed between the gate posts. A loop of wire around the gate and end posts helps secure them. The hook should be long enough to free the gate when disengaged.



Drill Gauge in Screwdriver Handle



With a drill gauge in the handle of your screwdriver where it cannot be lost, you can determine in a jiffy the correct size of twist drill to use for any small machine screw or bolt of unknown diameter. The handle, preferably the plastic type, is drilled with each size twist drill you have, drilling the holes in rows ¼ in. deep and stamping their size. In using the gauge, it is simply a matter of comparing the size of the screw or bolt with the holes in the handle.

Temporary Brake-Rod Repair

If the threads holding the yoke fitting on the end of a brake rod become stripped and you are unable to replace the rod at the moment, a temporary repair can be made in the following way: Drill a hole crosswise through both yoke and rod and then lock the two together with a machine bolt. To prevent end play, the bolt should fit the hole closely.

H. C. McMullen, Lincoln, Nebr.

Substitute Lathe Tailstock Center

When a tailstock center is damaged on a job and another isn't available, here's a substitute that will work as well, if not better. All that's needed are a tailstock drill chuck, a shank from a discarded drill bit and a steel ball. The shank is placed in the chuck and the end faced off. Then the face is counterbored to receive the ball. The hole should be small enough to take the ball tightly. When the ball becomes worn it is removed and a new one is inserted.

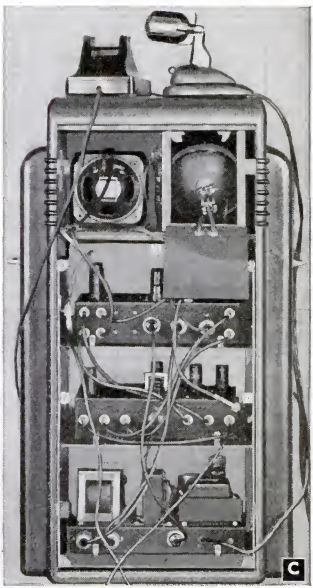
GROUP TELEPHONE CONVERSATIONS

WITHOUT the use of individual telephones and headsets, groups can now "sit in" on meetings with other groups or individuals at remote points, by means of a new instrument that looks like a console radio and a microphone. This electronic device, known as the Jordaphone, is not actually connected with the telephone line.

To use it on outgoing or incoming calls, the owner lifts the ordinary telephone handset from the telephone on his desk and places it in the top of the instrument as illustrated in photos A and B. Immediately telephone conversations may be carried on permitting all those in the room to hear what comes in over the wire, and any person in the group may reply without leaving his chair. Automatic amplifiers are claimed to amplify **voices far from the microphone and tone down those nearby so that all words reach the listener or listeners with about the same volume. These amplifiers may be seen in the rear view, photo C. When the telephone handset is placed in the inset, photo B, all outside noises are cut out from the receiving and transmitting ends of the handset. The magnetic fields surrounding the receiving and transmitting ends are the means by which conversations are picked up and fed through the loud-speaker.**

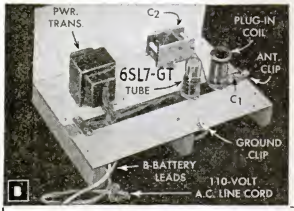
A

B


C

1948 LOW-COST PROGRESSIVE

By S. A. Johnson



SPECIALLY PLANNED for the beginner who wishes to build a one-tube broadcast receiver that can later be expanded at low cost into a larger set that will include the short-wave bands, this No. 1 set in the 1948 series of easy-to-build student units has a surprising "wallop" due to the use of a dual-purpose tube. The 6LS7-GT tube is actually two separate tubes in one envelope; one half of the tube is used as a regenerative detector and the other as an audio amplifier.

In this new model of the popular two-set progressive series, the No. 1 set is so designed that the filament, or "A" power is obtained from a transformer, but the "B" power comes from a standard 45-volt B-battery. Using a B-battery has much to recommend it for the beginner who is building his first set. The large power transformer is used for the "A" supply in receiver No. 1 as this same transformer will be used in set No. 2 to make it all-electric.

Set No. 2 in the series, to be described in the February issue, employs the same parts, with a few inexpensive additions, and there is very little change in the layout. If the builder does not contemplate building the second set some money can be saved by substituting a standard 6.3-volt, 1.5-amp. filament transformer for the large transformer.

The simple chassis is of rather unusual type as it is made of aluminum panels and wood as detailed in Fig. 2. The aluminum or similar sheet metal provides considerable shielding by the way it is used, and, as there are no large holes to be drilled for mounting the sockets, this thin sheet metal is just about as easy to work as the hard-pressed-wood panels used in previous sets of this type. The sockets are merely

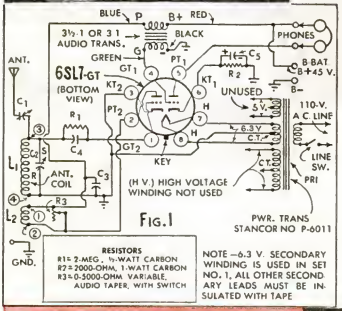


FIG. 1

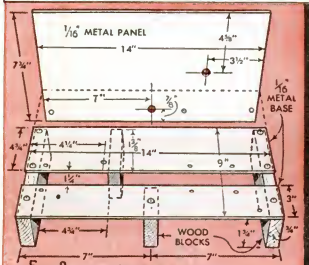
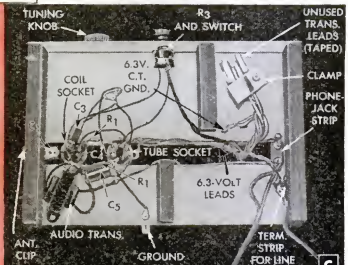


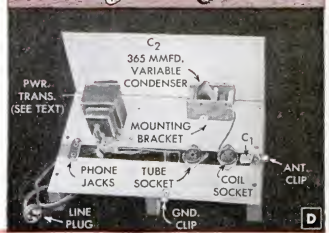
FIG. 2 DETAIL OF BASE



mounted across the separated base panels and fastened with short machine screws. A carefully detailed schematic circuit diagram appears in Fig. 1, and the pictorial wiring diagram with all parts located and specified is shown in Fig. 3. All leads and parts that are on the top of the base panels are indicated with dotted lines. R3 can be 25,000 ohms in both sets.

To begin construction, build the complete chassis (Fig. 2) first, then mount the various parts, following Fig. 3 and photos A, B, C and D. The power transformer is mounted on four ½-in. angle brackets. Next comes the wiring, which should be done with considerable care to avoid mistakes. The coil for this set is wound on a standard 4-prong coil form. This was done so that the coils for the larger set, No. 2, in the series can be added without making any changes. Wind the coil as detailed in Fig. 3 and make sure that the windings are exactly as shown by checking the prong numbers so that it will be "poled" correctly. After all wiring is completed, and the unused transformer secondary lead ends carefully taped, plug the coil into the coil socket, connect the set to the power and turn it on. The tube should light. If it does,

(Continued to page 226)



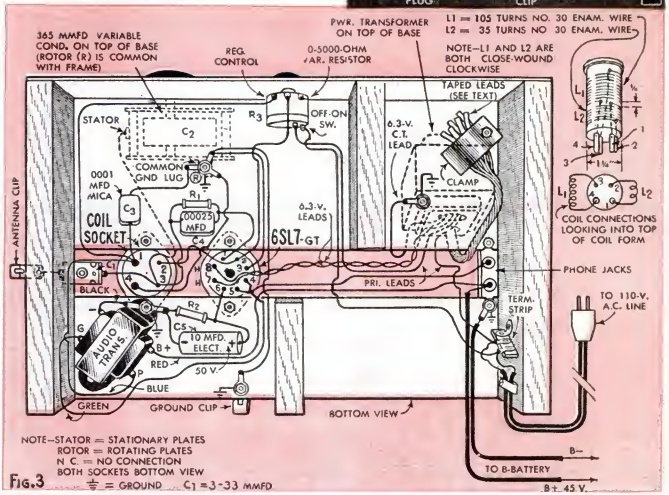


FIG. 3

Auto Radio Hints

A—Rear-deck car radio speaker permits passengers in both front and rear seats to enjoy clear reception without distracting the driver. This added speaker is installed in the deck under the rear window. The toggle switch, Fig. 1, is mounted on the dash and turns the rear speaker on and off. **B**—Direct-current ammeter of 30 or 40-amp. type indicates defects in auto radio. Normal reading in series with one battery lead should be 5 to 15 amp., higher reading may indicate defective vibrator or tube. **C**—Pushing down variable-condenser assembly with fiber tuning tool aids in checking loose connections. **D**—Holding soldering iron with tip raised speeds outdoor service heating. **E**—Noise may be caused by poor cable-fuse contacts; terminals should be cleaned with emery cloth. **F**—Cleaning plug-in terminals of antenna cable with emery cloth and working the plug back and forth in the socket several times will insure good contact. **G**—Handy tool for rotating tuning condenser or volume control in auto sets out of the car. It is made from flexible shafting with "spade" terminal soldered to one end and a slotted fitting on the other, as in photo No. 1; photo No. 2 shows tool in use.

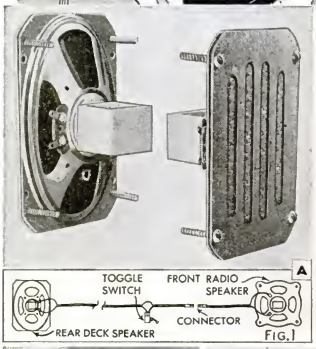
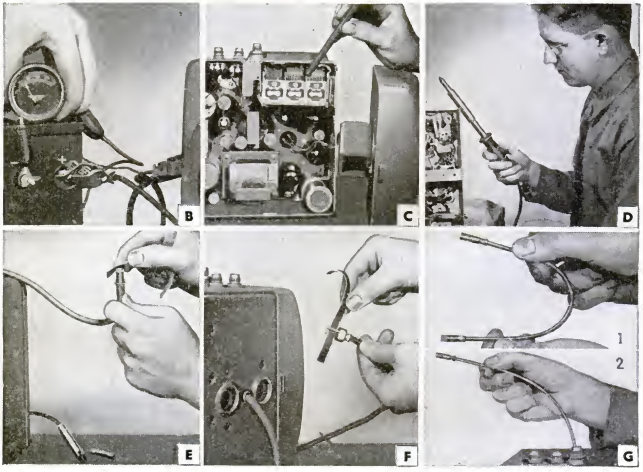


FIG. 1



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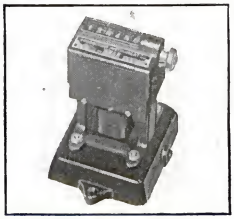
Complete details may be obtained from Production Instrument Company, 710 West Jackson Boulevard, Chicago 6, Illinois.



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1948 Low-Cost Progressive Receiver for Beginners—Set No. 1

(Continued from page 223)

then connect the B-battery—a process which should give a loud click in the headphones as the battery is connected. Now, with the antenna and ground connected, rotate the variable condenser C2. If the regeneration control has been advanced far enough you will hear some "whistles," indicating stations, as you rotate the condenser. Tune to one of the "whistles," then back off the regeneration control until the station comes in clear, with maximum volume. It is important that the unused secondary wires be individually insulated with friction tape and carefully secured to the chassis with a metal bracket as shown in Fig. 3. Some of these wires carry the unused high voltage in set No. 1, and must be insulated both from each other and from the metal chassis. The 6.3-volt filament leads are green; primary black. Use an outdoor antenna; however, an indoor antenna will give satisfactory reception on local stations. Detailed student material list R-362 for this one-tube progressive set No. 1 is available from Popular Mechanics Radio and Electronics department upon receipt of ordinary letter postage.

Jungle Home on Wheels

(Continued from page 103)

passenger's seat. It projected just enough to make a convenient step for getting in and out. GI gas and water cans were mounted in handy locations on the body.

The Russells bought a gasoline stove and icebox, and built lockers into every available cranny within the body. Side curtains with windows of transparent, fireproof plastic made the cab watertight. The curtains roll up when not needed and can be zippered into place from inside the cab.

The car came equipped with only one spare wheel, but Russell figured he should have two spares which could be added to the rear wheels to give added traction in case he got stuck. The only space available was on the tail gate, so he contrived a hinged carrier and attached it there.

At the same time, he decided to add a lean-to. He dropped the tail gate and fitted it with canvas sides and cover. The result was a small, enclosed back porch for storing up to 20 cubic feet of surplus gear when the Russells camp.

Field trials revealed the need for various additions and improvements in equipment. A second storage battery was added

(Continued to page 228)

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for inside lights. A small air-cooled engine was installed in a well in the left fender to drive a large generator; it consumes only a pint of gasoline per hour.

Four-wheel-drive cars have a handy lever for disconnecting engine power from the front wheels when traveling on highways. But even when not pulling, these wheels are turning the front axles, universals, differential and drive shaft, which means wasted power and wear on the tires.

Russell eliminated this condition by substituting blank hub flanges for the originals which were splined to the driving axles. Now the wheels spin freely on their bearings and nothing turns within the front assembly. And it takes only 10 minutes to change back to the original driving flanges.

By eliminating the wasteful drag and adding a special oil cooler, gasoline mileage was increased from 14 to 17 miles per gallon on a highway at 35 miles per hour.

Mr. and Mrs. Russell christened their juggernaut "The Tropical Tramp" and set out to live the life of carefree adventurers traveling in comfort. Their bunks are narrow, but comfortable. Their quarters are somewhat cramped, but seats fold out of the way to provide a restful front porch.

The dining table lifts and slides into metal channels which also house a smaller table for typing articles about their travels. The top of the icebox is upholstered to provide a comfortable seat.

The "Tramp" is cool. The outside was painted with aluminum paint to reflect the heat. The back end has two windows, the front two windows and a door. Each bunk has an 18-inch DDT-coated screen running its full length, and there is a transom in the roof. These openings, plus the windshield lowered, provide ample ventilation.

Now the Russells can enjoy driving to a beach that no ordinary car could reach. In 10 or 15 minutes they have their camp set up. Then they fish, swim, or just plain loaf until another secluded spot beckons.

Model Builders *Attention!*

Actual Size V-Plug

	V	V-2	V-3
Hex	1/2"	3/8"	9/16"
Thread	3/8"-24	1/4"-32	1/4"-32
Thread Length	7/32	7/32	3/32
Weight, Grams	8	3½	2½

Champion Spark Plugs for model gas engines give the same dependable performance as regular Champions. Champion Ceramic Insulation—Sillment sealed. Alloy needlepoint electrodes for easy starting. One piece construction.

CHAMPION

SPARK PLUG COMPANY • TOLEDO 1, OHIO

"Hope this won't make you mad, Jerry . . ."

JERRY: What's on your mind, Uncle Pat? I can take it.

UNCLE PAT: Well, you'd better return that saw and get your money back—if you still *can*.

JERRY: What do you mean? What's the matter with this saw?

UNCLE PAT: It's one of those bargain counter orphans, Jerry. No brand name. No reputation. Nothing behind it to back it up. It'll let you down just as sure as you're born.

JERRY: Brand names aren't *that* important, are they?

UNCLE PAT: They are to *me*. I want *quality* when I buy tools. That's why I always do my buying at the hardware store, where they carry the best in every line. And believe me, I never put my money down till I see a brand name I can trust.

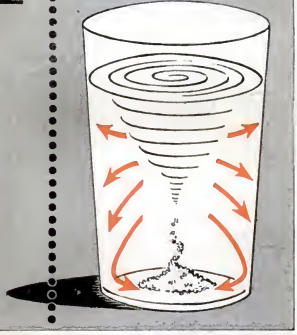
Your HARDWARE DEALER sells QUALITY tools and hardware . . . Buy from HIM

POPULAR MECHANICS

TEST YOUR SCIENCE i.q.

Answer to Problem on Page 97

Action of the sugar does not refute the law of centrifugal force, but occurs due to natural causes. Due to the shape of the spoon and irregularities of stirring, the sugar in the rapidly moving column of liquid is well scattered. When the spoon is removed, the liquid settles down to a regular rotary motion which builds up a pressure area on the wall of the glass. As rotation is retarded, the liquid in the lower part slows down first due to friction with the bottom, making the pressure against the wall less at the base. As pressure always tries to equalize, there is a flow of liquid down the wall equal from all sides so it flows radially from the center of the floor and then upward. This flow carries the sugar with it, tending to pile it up in the center.—By Rex Taylor.



So backlash free you can learn to cast with it in 5 minutes. You get a bonus of long, accurate casts, too. That is why WONDEREEL is perfect if you don't fish a lot, are out of practice or fish at night.

Try this reel with *casting skill built in.* Your sports store has it in DeLuxe, Lightweight, and Regular.

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SYNCRO has NO continuous cutting blade nor "Long stroke" blade to *pull* fingers into *teeth*—instead there are 14,400 strokes per minute—7,200 short cutting strokes plus 7,200 upward NON-CUTTING, REPELLING strokes! (Fig. 1) SYNCRO will not even CUT wood unless piece is pushed FIRMLY DOWNWARD AGAINST blade and FIRMLY FORWARD — both actions at SAME time! SYNCRO blade teeth cut ONLY on DOWN stroke. (Fig. 2) Teeth raise, repel, push away any object on UP stroke. (Fig. 3) When blade moves UP it KICKS finger away free! On down stroke, blade does not move *far enough* to accidentally cut finger unless finger is *intentionally, deliberately* fed into blade like wood is fed in Figure 1. No wonder SYNCRO is the world's SAFEST saw . . . it feature old and young users acclaim!

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☐ Express charges collect or ☐ Parcel Post charges collect
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Vibra-Tool complete with 22 attachments in handsome, polished wood chest.....$16.50

BURGESS BATTERY COMPANY
HANDICRAFT DIVISION
LAKE ZURICH, ILLINOIS

Time From the Stars

(Continued from page 140)

As many as 100,000 customers, including business houses, depots, radio stations and schools, receive Naval Observatory time via Western Union. The time beats regulate 2000 Western Union master clocks.

Although these master clocks seldom drift more than a second from accurate time in 24 hours, they are reset daily to keep them in time with the observatory's signals. The clocks have an hourly contact that synchronizes the subscribers' self-winding clocks.

Subscribers' clocks are of the spring-wound, pendulum-controlled type. A small electric motor, energized by two dry-cell batteries, assures constant operation regardless of outside power failure. Electrical impulses actuate a synchronizer in each clock which resets the hands each hour.

The synchronizing service is the most popular of three kinds of time services furnished by Western Union. A second service, known as "noon beats," requires the subscriber to set his own clock. This service consists of a wire connection with the circuit carrying the Naval Observatory time beats during a three-minute period ending at noon (EST). These signals are sent by Morse sounder to jewelers, laboratories and local telegraph and railroad offices for checking timing devices.

A third service is called "jewelers' beats." It is a transmission from one of the central master clocks equipped with a coded contact wheel that repeats the five-minute observatory pattern of second beats over and over through the day.

There are many uses for accurate time service other than checking the operation of clocks and other timepieces. Accurate measurement of time is of importance in seismology, geodesy and navigation. Time signals are used by schools, scientific laboratories, manufacturers and users of radio communications equipment.

All these services are based upon observations made at the Naval Observatory. Since 1844, the observatory has been located atop a knoll about two miles north of the Lincoln Memorial. Then out of the settled area, today it is surrounded by the city of Washington. Smoke and dust so obscure observations that a move to a more isolated area has become necessary.

The transfer will take place over a period of years and the time signals and observations will not be interrupted. During its transfer and after its establishment in the new location, the Naval Observatory will continue to supply accurate time to all who need it as it has since 1865.

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A TOOL THAT PACKS EXTRA YEARS OF PLEASURE

. . . LOOK AT THE REST, THEN BUY THE BEST

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PRE-WAR PRICES STILL PREVAIL

Moto-Tool Kit No. 2 with 23 accessories (high speed steel cutters, grinding wheels, polishing accessories) and heavy-duty professional Model 2 Moto-Tool in natural-finish, hardwood case. . . **$23.50** (Items purchased separately would cost about $30.00; you save $6.50.)

Moto-Tool No. 2 with one emery point **$16.50.**

Moto-Tool Kit No. 1 with 23 accessories and Model 1 Moto-Tool in wood case **$17.50**

Model 1 Moto-Tool with one wheel point **$8.85**

14 REASONS WHY MOTO-TOOL'S A BETTER BUY

● Housing has "pencil-type" finger grip ● Instant-action, wrenchless chuck ● Oil-less (sealed) trouble-proof bearings ● Patented automatic chuck-lock pin ● Over-size armature shaft, hardened, ground end polished ● 110 volt, universal type (AC-DC) motor ● Easily replaced commutator brushes ● About 27,000 R.P.M. cuts cleaner . . . saves cutters ● Sliding snap-type switch ● Handy hanger hook; cord protector ● Sturdy, shockproof bakelite housing ● Dust filtered, air-cooling system ● Weighs only 3 oz. . . . shaped to fit the hand ● Dynamically balanced for vibrationless operation.

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Buy Dremel Moto-Tool from your Dealer. If he cannot supply you, order direct from factory on 10 day trial. Shipped postpaid for payment in full (send check or money order); or send only $2.00, we will ship C.O.D. You pay balance plus postage.

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All wheels 3/32" thick with 1" hole. State size of shaft if smaller than 1". Proper bushing will be sent free.

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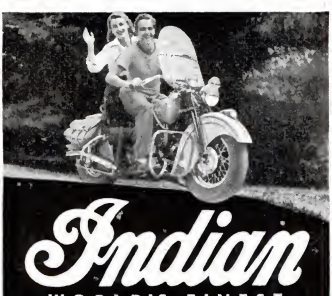

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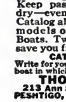

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Make more money the Modern way! Everywhere grass grows and lawn mowers are used offers you unlimited opportunities to make up to $1000.00 per month in a business of your own. For the first time in history, you can sharpen any reel type lawn mower from a five inch edger to a thirty-six inch power mower in from ten to twenty minutes. Dismantling is unnecessary. Handle, wheels, roller and motor remain in place when sharpening even the most complicated mower. The Modern Lawn Mower Sharpener eliminates all hand filing. It precision grinds to extreme ends of both left or right twist reel blades. Bottom knife is held in same brackets for sharpening. No extra attachments required for grinding. Hand, power, gang or fairway units sharpened equally fast . . . equally easy for greater profits. Anyone can operate the Modern Lawn Mower Sharpener. It is simple in design and simple to operate. Send for details today!

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Digging Into Mexico's Past

(Continued from page 135)

the simple wheel to provide a means of transporting men and goods over long distances, and because they had never heard of the Chinese invention of gunpowder.

Finally, archeologists are looking for treasures of gold and precious stones which are thought to be buried in the ruins of Mexico. From a strictly scientific point of view, such treasures are incidental to the exploration of ancient civilizations. But they do lend a spice to the scientific excavating. Furthermore, they stimulate search by amateur archeologists and spur on native workers hired to help with the digging.

At Monte Alban, the famous Tomb Seven in 1932 produced more than 300 valuable items: a pearl as large as an egg; many smaller pearls and turquoises; goblets of gold, silver and rock crystal; a golden mask; engraved and filigreed gold jewels; necklaces, bracelets, earrings and lip and nose plugs.

To follow the trail of ancient civilizations, an archeologist must be an expert in many fields. In addition to being a scholar of history and languages, he should know how to analyze soils, build a scaffold, hoist weights weighing tons, take good photographs, preserve crumbling art objects and manage men. He should also have an "eye for the country"—for random digging is not scientific digging.

Archeology is not a science that calls for a steam shovel or a bulldozer. Best results are obtained by natives doing the rough work with hoe and basket, followed by trained archeologists with trowel, brushes, screens and microscopes.

Occasionally, however, the archeologist borrows the techniques of the coal miner. A likely looking mound may be tunneled vertically or horizontally. If it still seems promising, it will be completely excavated.

Aerial photography has proved useful to the present-day archeologist. Mapping planes are sent over hard-to-get-to jungle and desert areas that are believed to cover important ruins. After a site has been excavated, its location and dimensions may also be thoroughly rechecked by aerial photography.

Latest scientific device used to locate important archeological ruins is the potentiometer. In locating the skull of the oldest man near Mexico City, Dr. Hans Lundberg, Canadian geophysicist, and Dr. Helmut de Terra, American geologist, used the principle of earth conductivity.

(Continued to page 240)

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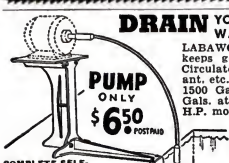

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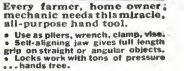

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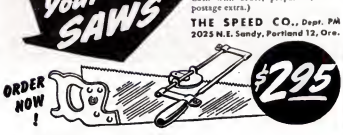

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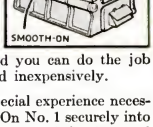

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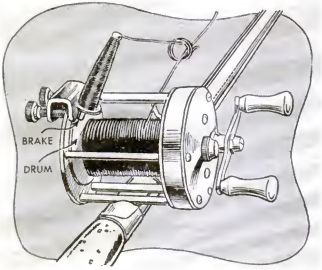

Backlash and over-run are eliminated automatically by a brake that attaches to any fishing reel. The brake stops reel spin the moment the bait touches water and the line slackens. Tension on the line, which is threaded through an eyelet on the brake, holds the brake shoe away from the reel during casting. When the line slackens, the coiled spring presses the brake against the reel, stopping its motion.

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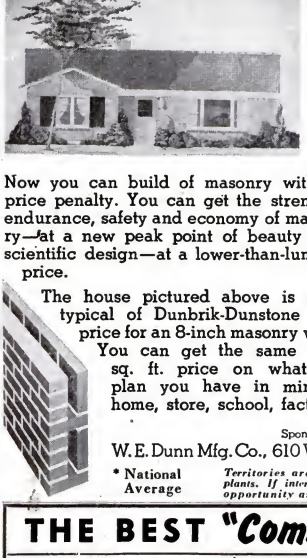

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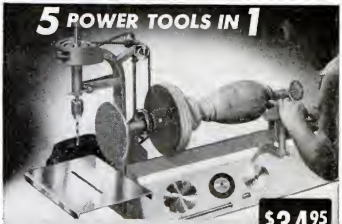
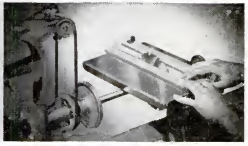


LATHE 10" swing, 30" between centers, ¾" spindle, face plate, spur center, tool rest. **$34.95**

SAW

Takes 6" to 8" blade. Arbor handles scratch brush, grinder, buffer. Saw blade not included.



DRILL PRESS

Takes drills to ½". 2" travel, ½" spindle.

Drills to center of 12" circle.

GRINDER

5" Emery wheel furnished. 4 step cone pulley.

Spindles mounted in replaceable bronze bearings.

SANDER

8" diameter disc takes any type abrasive. Heavy construction lasts for years. Motor not included in price.

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The Kreger Concrete Block Mold...makes a block a minute...for 3 cents each! This barbecue is made of 40 block ...easily put together. Over 50,000 satisfied users.

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You can build or repair anything from a foundation to a complete house with block you make yourself. They meet all building codes.

THIS AMAZING MOLD LASTS A LIFETIME—COSTS ONLY $15.00

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The No. 4810 Kreger Patio Block Mold for walks or patios makes block 8" x 16" x 2½" (or thinner). Only $6.50, prepaid.

KREGER DRIVEWAY BLOCK MOLD

The No. 4812 Kreger Driveway Block Mold makes driveway block 16" x 8" x 4", at a cost of 6¢ each (100 linear feet of double track for only $18.00!). Cost is only $7.00, prepaid.

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Also 50¢ 4-oz. tube. Pts., qts., gals., for industrial use.

AMBROID

303 Franklin St., Boston 10, Mass.

New Methods in Old Mines

(Continued from page 120)

liquid with a specific gravity between the gravities of the good and useless ores. Waste rock bobs to the surface of the bath and floats away; chunks containing the valuable heavier ingredient sink to the bottom or the ore may rise and the waste seek the bottom.

A simple example of the process would be the separation of wood chips from gravel by dumping a mixture of the two materials into a tub of water. The wood chips float and the gravel sinks.

There are a number of heavy liquids that can be used similarly to separate lightweight and heavyweight pieces of rock. Most of them are expensive and somewhat toxic. It usually is more practical to manufacture a heavy liquid by stirring into suspension in water a quantity of finely ground particles of some heavy solid. Such a bath has all the properties of a true liquid and may be enriched or diluted to the exact specific gravity desired.

Chunks of ore that pass through the bath pick up some of the suspended material and carry it away, changing the gravity of the bath and sometimes creating extra milling problems. In the case of Heavy-Media Separation, the name of the sink-float process controlled by the American Cyanamid Company, these difficulties are overcome by a unique means.

American Cyanamid, in most cases, uses a bath that contains fine particles of magnetite or ferrosilicon, each a heavy and a highly magnetic material. Water sprays wash the material from the ore and waste and the material is then removed from the spray water by electromagnets. After being demagnetized by passing through a special coil, the magnetic material then is returned to the sink-float bath.

The first Heavy-Media Separation plant for continuous operation was installed at a zinc mine in Tennessee to replace a jig apparatus that had been used as a concentrator. The new process discarded 20 percent more material than did the process it replaced, reduced the load that went to the mill by that amount and at the same time produced a concentrate that was four percent richer.

Zinc-lead, magnesite, fluor spar, tin, gem and abrasive garnet ores are all being concentrated by Heavy-Media Separation. Pilot-plant operations prove that the process also is suitable for concentrating copper, silver, gold, pitchblende, tungsten, nickel, manganese, chrome, phosphates, potash,

(Continued to page 248)

Electric WONDER PEN

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DECORATE Leather, Cork, etc.

Works like Magic for Lining, Etching, Shading!

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7" wheels	60c
6" wheels	50c
4" wheels	30c

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10 x 1.75"	$2.75
10 x 1.25"	$2.00
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Industrial wheels for heavy loads

Semi-Pneumatic

400 x 8, 2 ply tire and tube	$12.50
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10 x 2.75"	$6.75
10 x 2.75" Single Tube	$7.25
8 x 1"	$4.90
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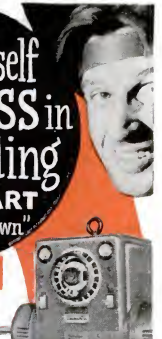

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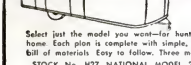

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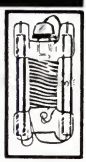

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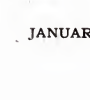

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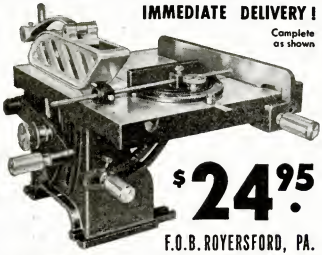

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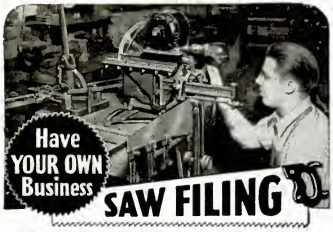

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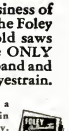

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Send Free Plan on Saw Filing business, no obligation

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gypsum, and cement rock ores. Even diamonds can be collected by Heavy-Media Separation and a plant is being built in Africa for this purpose.

Heavy-Media Separation automatically removes slate and other refuse rock from coal. One such plant for cleaning coal is in use and others are under construction.

The process also is of value to the operator of small mines. In the western states there are numerous deposits of valuable ores that contain tonnages too small to warrant full-sized mine and mill operation. Now these ores may be mined and concentrated and the concentrate hauled to a mill for final processing. One western manufacturer builds small prefabricated Heavy-Media Separation plants for this purpose, with capacities from 5 to 25 tons per hour.

Many old mine dumps contain values that can't be recovered profitably by crude methods but that can yield a return after sink-float concentration. Test batches of low grade tin-tungsten dump material from England, treated by Heavy-Media Separation, resulted in retention of 62 percent of the tin and 83 percent of the tungsten in the ore after rejecting nearly 70 percent of all the material that was fed into the cone.

Some of the old ore dumps at such ghost towns as Virginia City, Tombstone and Panamint City have been worked profitably two or three times in the past by taking advantage of new handling techniques. Even these dumps may be made to yield additional precious metal by employing modern methods.

Uncle Sam Looks Into Housing

(Continued from page 160)

several standard tests used on building materials. There is a standard fire-resistance test and several tensile-strength tests. In the fire-resistance test a sample section of a wall is exposed to flames in a special furnace. To pass the test the wall must not crack so as to permit flames to pass through it, or must not become so hot on the unexposed side as to set fire to cotton waste placed against it.

To test whether specific walls can carry the weight of the roof, a hydraulic press is used to exert pressure until the wall is crushed. A weight equivalent to 10,000,000 pounds can be applied. A smaller press is used to test structural materials of smaller dimensions.

Not all government research on housing is carried out at the Bureau of Standards.

(Continued to page 252)

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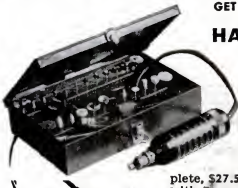
HANDEE KIT



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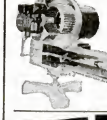

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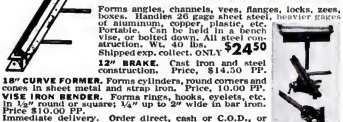

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2-1/2	1.95	*13-inch or larger lathes.	
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3-1/2	3.00	**9-inch and 10-inch lathes.	
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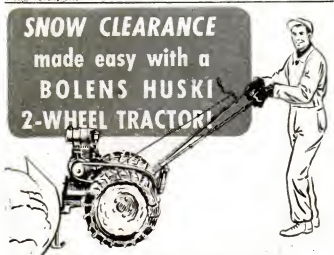

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Bolens HUSKI 2-WHEEL TRACTORS

THE STANDARD FOR OVER 40 YEARS

Research on wood in construction, for example, is done principally at the Forest Products Laboratory of the Department of Agriculture at Madison, Wis.

Wood is still the major building material. According to figures recently released by the Department of Agriculture, 57 percent of timber cut is wasted. Some of this waste is unavoidable as much of the lumber is unusable.

As a result of Forest Products Laboratory experiments on this cull lumber, Tennessee Valley Authority engineers became interested and developed a method of using this type of lumber in laminated boards suitable for flooring.

Short logs are cut lengthwise into strips, kiln-dried, sorted and machine-surfaced on all four sides. The strips are cut into one-foot lengths and the plies assembled with resin glue to produce a board 12 inches wide. The best grade is chosen for the top surface, the second best for the bottom and the poorest for the middle ply. The strips are fed into a continuous hydraulic press. Leaving the press the boards pass to a side-matching machine which cuts the tongue and groove. The width of the boards speeds the laying of floors.

Samples have been produced using oak, walnut, hickory, maple, ash and mesquite. Some of the surfaces have been quarter-sawed to produce a richly grained texture. A private firm has leased the original machinery used in the research from TVA and the flooring is expected to be on the market shortly.

Another attempt to utilize waste lumber is being made by the Office of Technical Services of the Department of Commerce. The OTS is sponsoring research to develop prefabricated houses using a new type of wood veneer made from low-grade and presently unused peeler logs.

Under the terms of a six-month contract with a private research organization, a complete model prefabricated structure incorporating the veneer panel will be designed, built and tested under the specifications of the National Housing Agency.

The panel, called "K-Veneer," uses a veneer $\frac{3}{16}$ inch thick made from western hemlock peeler logs. Depending on its intended use, the veneer is strengthened by an overlay of sheet aluminum, sheet steel, heavy paper or other material glued to it.

Plans call for shipping the veneer in rolls to prefabricated-housing manufacturers for assembly into panels complete with interior and exterior walls and studs ready for site erection, according to procedures to be developed in the research project.

(Continued to page 256)

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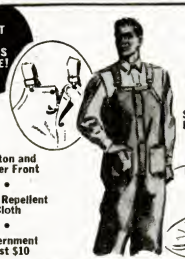

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32 DRAWER UNIT $4.95

64 DRAWER $7.95

for home or shop

THE JIFFY all metal CABINET

THE HANDY WAY TO KEEP SMALL PARTS, WASHERS, NAILS, SCREWS, NUTS, BOLTS AT HAND

DRAWER SIZE
1¼" DEEP
3" WIDE
8" LONG

CABINET SIZE
32 Drawer Unit
8" DEEP
12¾" WIDE
15½" HIGH
Shipping Weight 9 lbs.

64 Drawer Unit
8" DEEP
25½" WIDE
15½" HIGH
Shipping Weight 18 lbs.

For small items, the low-cost Jiffy Cabinet, 32 or 64 drawer units that put office, shop, work bench, household and hobbyist needs at your fingertips. Metal flange drawer guides. Spot welded all metal cabinet with sturdy laminated drawers insures long time-saving service. Why fumble? With the Jiffy you know where it is. 32 drawer unit—$4.95; 64 drawer unit—$7.95. Send check or money order — No C.O.D.'s please. Ohio orders please add 3% Sales Tax.

KAYTEE PRODUCTS

Dept. M, Box 588 Canton, Ohio

The Office of Technical Services is also sponsoring research to determine the materials and methods most suitable for constructing floors in low-cost houses without basements.

A house will be built at the University of Illinois into which various types of experimental slab-on-the-ground floors will be fitted for different kinds of tests. Each type of floor will be put through a series of tests, including the measurement of surface temperatures, heat losses and moisture absorption and condensation. At the same time tests will be made on various kinds of floor coverings, wall panels and heating systems.

These experiments and other research now going on in public and private laboratories will add much to our store of information on better housing. A lot has already been learned since the first World War when housing research was born. Because houses are built for a lifetime, and usually last several lifetimes, evidence of progress is not immediately widespread. The number of houses added each year to the total existing is comparatively small. But, over a longer period of time, research is providing better houses for an intensely "home-minded" nation.

There's Money in Honey

(Continued from page 148)

combs of the infected colonies should be destroyed by burning.

Apiary inspection is a function of the states and is maintained by most State Departments of Agriculture. You should refer to them all questions concerning apiary inspection, diagnoses and proper methods of control. As a service to beekeepers, however, the Division of Bee Culture of the U. S. Department of Agriculture examines, without cost, samples of brood and adult bees. Reports of diagnoses are sent to beekeepers and state apiary officials.

If you send a sample, observe these simple rules: mail a four-inch square of the comb which contains the affected brood or brood remains. Avoid including any honey if possible. In the case of adult bees, send from 100 to 200 sick or dead bees. All samples should be mailed in a wooden or heavy cardboard box. Do not use tin, glass or waxed paper. Address all samples to: Division of Bee Culture, Agricultural Research Center, Beltsville, Md.

A couple of questions that always are asked by beginners are: How do you avoid bee stings? Do the bees leave you alone after they are acquainted with you?

(Continued to page 260)

The New HOOVER *Fractional Horsepower Motors*

¼ horsepower and up

You can be sure of getting the finest in fractional horsepower motors when the name "Hoover" appears on the name plate.

These great new motors are built with the same engineering skill and dependability that go into the world-famous Hoover Cleaners. Compact, precision made, they deliver their power with work-horse stamina.

A Hoover fractional horsepower motor will give you years of efficient, trouble-free service.

FEATURES OF THE HOOVER MOTOR

Induction run . . . single phase . . . 60 cycles . . . dual voltage—110/220 . . . 1725 R.P.M.

Capacitor start . . . more than 300% full load starting torque with minimum current flow.

No vibration or "shift" . . . integral feet, carefully machined to give solid mounting and quiet operation.

Low temperature . . . electrical and mechanical design for low-temperature operation. Ventilated open type. 40° C. Rise.

Laminated steel rotor . . . carefully ground and balanced for maximum efficiency.

Centrifugal starting switch . . . designed and built for years of trouble-free operation.

High-grade ball bearings . . . sealed against dust and grit, give smooth performance and long wear.

Rotation . . . clock or counterclockwise.

Sold only through retail outlets.

THE HOOVER COMPANY

Electric Motor Division—North Canton, Ohio
Hamilton, Ontario, Canada

WRITE FOR YOUR FREE COPY OF THE NEW KRW HYDRAULIC PRESS BOOK

Describes all manner of Production and Shop Work on KRW Hydraulic and Bench Type Arbor Presses. 32 pages illustrating the new KRW Hand-operated, Electric-operated and Air-operated Hydraulic Presses. *Write for your copy today.*

K. R. WILSON, DEPT. 17, 215 MAIN ST., BUFFALO 3, N. Y.

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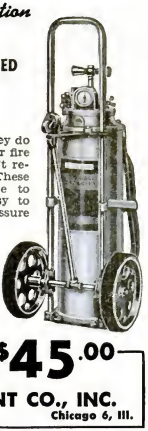
WAR SURPLUS BARGAIN!

NEW-UNUSED FIRE EXTINGUISHERS

Get Real Fire Protection at lowest cost

- UNDERWRITER APPROVED
- READY TO USE
- 3½ GAL. CAPACITY



Put out those fires before they do serious damage! Be ready for fire when it comes—regrets won't restore lost lives or property. These fire extinguishers are made to Government standards. Easy to use—easy to refill. Stored Pressure type Carbon Tetrachloride extinguishers like these are providing real fire protection in plants, warehouses, farms, ranches, homes, summer resorts, etc., everywhere.

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ACME EQUIPMENT CO., INC.

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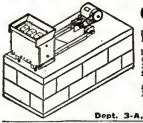
SAY YOU SAW IT IN POPULAR MECHANICS

BUILD THIS

CONCRETE BLOCK MACHINE



Sell blocks; or build your home, garage, barn at ½ cost by making and laying your own blocks.

This simple machine which you can build yourself at a cost of about $15 (excluding motor) will make a block in 30 seconds using only one form. 2 to 4 forms can be used on each vibrator.

Power driven concrete mixer plans also. Send dime for details and "How to Make and Lay Blocks."

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NONE BETTER!

SUPER DRILL GRINDER

Sharpens round shank drills from 3/32" to 1-1/16" in diameter, up to 11" long. Grinds old drills like new in 4 different point angles, using hand or power grinding wheels. Money-back guarantee.

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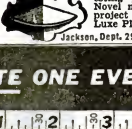
$1.00 POSTPAID

SPECIAL OFFER! Famous, patented, lock-stitch sewing awl complete with needles, waxed thread, direction folder. Hundred uses—sewing, repairing leather goods, canvas, belting, old or new harness, saddles, gun cases. Satisfaction guaranteed, or money back. Send currency, check, or money order, no stamps, please. Yates Mfg. Co., 611-H Main St., Lake Geneva, Wis.



48 PLANS $1.00

48 complete plans of toys, ash trays, garden ornaments, Dutch boys and girls, what-not shelves, and many other interesting projects. Finest selection available. Novel method allows you to make finished project any size desired. PLUS FREE De-Luxe Plan of corner shelves. Send only $1 to Jackson, Dept. 29-5440 N. Shoreland Ave., Milwaukee 11, Wis.

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160 Value-Packed Pages of the Latest and Best in RADIO • TELEVISION • Electronic Equipment!

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Five Tube AC-DC Radio Kit

With Plastic Cabinet! Covers 550 to 1600 KC. AC-DC superhet using 12SA7, 12SK7, 12SQ7, 50L6 and 35Z5. Includes automatic volume control, airplane dial, built-in loop antenna, and new Alnico V speaker. Cabinet is a beautiful modern design in brown plastic. Kit contains all parts to build complete receiver.
C24456—With Cabinet and Tubes $14.75

AC Solenoid

Compact solenoid, DC resistance 20 ohms. Wound on brass tube with ID of .210". Operates on 6 to 10 volts AC, constant duty, or 4 to 7.5 volts DC constant duty. 1-11/16" long, 9/16" dia.
C10282 ..... 19c

Carbon Throat Microphone

Will work into any 200 ohm impedance input circuit. Adjustable strap to fit neck. Allows full use of hands and head while speaking. Ideal for ultra high frequency mobile amateur work. With strap, 10" cord and plug.
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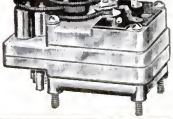
Jack Box

Consists of one 3 circuit jack, one single circuit jack, one 150.000 ohm potentiometer, 5 position rotary switch enclosed in aluminum case 4½" long, 3" wide, 3" high. With knobs. Circuit diagram inside cover. Ship. Wt. 2 lbs. 5B3959 ..... 25c



Experimenters Motor

Compact induction type AC motor operates from 25 to 30 volts AC, 60 cyc. Motor speed 2400 rpm with gear train driving ¼" shaft at 24 rpm. Thermal cutout prevents overload damage to motor. Measures 2 x 1¾ x 3", excluding shaft which is ¼" dia. extending 2⅞".
C14699 ..... $2.50

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Yes, rush FREE COPY of the comprehensive new Concord Radio Catalog.

Name.....

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A key tool to increase your shop's "capacity" is the new Power King band saw. Gives you new speed and accuracy in every band saw operation in wood, plastics, and light metals.

You can be sure of smooth, accurate sawing with the Power King — it's a *solid* 135 pounds of properly engineered weight. Big (14" x 14") *precision-ground* table has 12" capacity from blade to frame 6½" from table to guide — tilts 45° to right. Saw cuts to center of 24" circle. Saw wheels turn on 4 *precision* ball bearings. Blade is guided by 4 oilite bronze bearings — supported in back by 2 *ball* bearings.

Here's a quality tool you'll be proud to have in your shop — built for years of service. Send coupon for complete details and name of nearest dealer.

OTHER TYPES OF POWER KING SAWS

POWER KING 7"-8" TILT/ARBOR TABLE SAWS

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Although often classed as domestic animals along with horses, cats, dogs and pet canaries, bees have remained untamed in spite of all the care that man has lavished upon them. They will sting if hungry or if they are handled in cool weather. After a bee stings you, his death comes quickly. A sting is a sacrificial act committed in defense of the hive.

A beekeeper must dress for his work. A hat and veil should be worn at all times to protect the face. Gloves, a heavy jacket and trousers—tied tightly around wrists and ankles—will keep bees from stinging through. White is said to be most soothing to bees while the smell of perspiration, liquor, perfume or lipstick often will arouse them to a fighting-mad pitch.

If you dress properly, keep your bees well fed, handle them gently at all times and use your smoker to quiet them, bee stings should be few and far between. When bees are swarming, they are not inclined to sting. On such occasions you can put a queen on your chin and soon have a heavy beard of living insects.

Beekeeping can be a fascinating hobby. It is designed both for the lazy man who enjoys the sun and for the ambitious, hard-working man who increases his hives to a point where they will produce a comfortable living for himself and his family.

Skiers Awaken a Bonanza Town

(Continued from page 92)

special lift has been built just to serve it.

Friedl Pfeifer, a wartime ski-trooper and one of the best known instructors of the Arlberg system, heads the ski school. He favors class over individual instruction, with his most experienced aids handling the beginners. Pfeifer's school stresses snowplows and snowplow turns, made by pointing the skis in a "V" and shifting weight to the leg opposite the direction of the turn to be made.

Down below, in town, the restoration spirit has taken a firm hold. "Gingerbread" homes are being repaired, repainted and reoccupied, old business places are beginning to hum again and new shops are springing up. Much of the initiative and manpower is coming from those Camp Hale ski soldiers, who promised they'd come back to Colorado to live, after fighting brilliantly in Italy's mountains.

Though still in small numbers, writers, artists and musicians are establishing full or part-time homes in Aspen. Famous concert stars like Burl Ives, the Chicago Symphony Trio and Richard Dyer-Bennet are

(Continued to page 264)

NOW MORE GOOD NEWS FOR YOU from Atlas

New 10 INCH TILT/ARBOR FLOOR SAW

NEW — from its large, precision-ground table to its extra-heavy base . . . built to exacting industrial standards for commercial or home shop use . . . designed for easier, more accurate sawing . . . that's this new Atlas 10" Tilt/Arbor floor saw!

You really have to see it to appreciate its advanced engineering and precision construction. The large 27½" x 27½" table gives you 13¼" working surface ahead of the blade. New engineering design gives you maximum blade rigidity in any position with easy-working height and angle controls. Saw arbor turns on precision ball bearings.

An outstanding feature is the rip fence — *self-squaring*, locks at *both* ends, *releases instantly* for positioning or removal — with *two ball bearings on rear rail* for easy sliding.

This new Atlas saw is really *built*— to give you years of dependable service. Ask your Atlas distributor, or send the coupon for free illustrated bulletin.

• 27½" x 27½" table — with 13¼" working surface ahead of blade; 19½" to right, 8" to left • Cutting depth: 3¼" • Blade tilts to 45° — locks rigidly at any height or angle • Sealed, precision ball bearings for permanent smooth operation • Dual V-belt drive — uses standard 3450 RPM motor • Massive construction

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Please send me the free illustrated bulletin about the new Atlas 10" Tilt/Arbor Floor Saw.

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Renew the edge for every shave

$1.25
RAZOR, STROP AND 5 VALET BLADES

SELF-SHARPENING . . . ONE PIECE

SAY YOU SAW IT IN POPULAR MECHANICS

AMERICA'S LOWEST PRICED
BAND SAW

Now $16.95

ENGINEERING FEATURES FOUND ONLY IN HIGHEST PRICED MACHINES

Practical, modern design; new improved model. Accurate, smooth operation. Cuts to center of large 14" circle. 2½" thick, Genuine "Oilite" bearings, adjustable ball-bearing blade guide. Upper wheel micromatic four-way blade tension and adjustment. Safe, fully enclosed mechanism. Thoroughly proved construction, rugged designed with sturdy laminated plywood. Stands covered all. As illustrated—blade included. Immediate Delivery! See your dealer or send only $16.95, and we'll pay all shipping charges. If you prefer, will forward C.O.D. plus Money-Back Guaranteed: not satisfied upon receipt of band saw, return immediately for refund.

909 MARKET — SERRO MFG. CO., Dept. 102 — ST. LOUIS 1, MO.

V-8 DUALS & SINGLES

DEALERS WANTED

MUFFLERS
STEELS and ALUMINUMS with a motorboat tone

SINGLES, Chev., V-8, Plymouth, Steels $5.50, Aluminum $7.00. Chry., Olds., Buicks, etc., Steels $7.50, Aluminum $9.00. V-8 and MERCURY DUALS, Steel $17.50, Aluminum $21.00. Split Manifold Sets, Steels $35.00, Aluminum $45.00. Aluminums are guaranteed for life of your car.

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Gerstner TOOL CHESTS
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22 Big Money-Makers in a Single Line!

Amazing New Fluorescent Lights with *Circular Tubes*

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FREE *Sales Outfit* Don't send a penny. Sample Outfit is FREE. Rush name on penny post card for money-making facts about sensational new "CIRCLINE" Fluorescents. Latest scientific development gives you 22 new type circular tube fixtures for kitchens, dinettes, halls, and play rooms. Also Floor and Table lamp for living rooms and pin-ups for shaving and vanity tables. Sells on sight to homes, restaurants, stores, offices. No other fluorescents like CIRCLINE. Salesmen who order samples quickly reorder in large quantities. All fixtures complete with tubes. No waiting. Also immediate delivery on all standard type Fluorescent Fixtures. This is too good to miss. Big, quick profits waiting. Rush name on postcard today for FREE Sales Outfit.

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Makes excellent home lighting plant, operated by wind propeller, waterfall, gas engine, or hand crank. Reduction gear allows full output at slow speed; supplies 6 volts at 2.45 amp., 425 volts at .115 amp. New. Add postage for 28 lbs. **$7.95**

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New B29 navigation instrument which can easily be used to make a good contact printer, strip map holder, etc. The plywood case 14¼"x11"x10" high is perfect as a tool kit, camera, projector case or for building a portable phonograph picnic kit, make up case, etc., has leather handle reinforced covers, 8 covered compartments in bottom. Cost Gov't $125.00. Add postage for 20 lbs.

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Complete kit to build excellent 25 watt amplifier, ideal for P.A. system, phonograph amplifier, etc. Push pull circuit using best parts. Supplied with 4 tubes, punched chassis, blueprints and instructions. Add postage for 25 lbs. **$14.95**

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TUNING UNIT

A beautifully constructed tuner containing the best in variable condensers, coils, vernier dials, etc., at least $30.00 worth of parts, complete with conversion instructions to transmitter and receiver. Add postage for 20 lbs..... **$2.49**

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Complete kit for building a fine amateur transmitter includes every part—tubes, cabinet, 80 meter coil, crystal, blueprints and instructions, less power supply. Add postage for 30 lbs.... **$19.50**

HEATHKIT VACUUM TUBE

VOLTMETER KIT

Build yourself this beautiful Electronic AC and DC voltmeter and ohmmeter ranges 3 volts to 1000 volts and to 1000 megohms. Every part supplied including blueprints. Add postage for 8 lbs. **$24.50**

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$1.00 Hearing aid type, comfortable, keeps out outside noise, one of the army's best types.. Add postage for 2 lbs.

THROAT MICROPHONE

Used by army in noisy applications in aircraft, tanks, etc. Many interesting home uses. Add postage for 1 lb..... **$1.00**

WALKIE-TALKY UNIT

$1.00 BC746 Tuning Unit contains two crystals, receiving coil and condenser and transmitter tank coil, fine for radio builders. Add postage for 1 lb.

T32 TABLE MICROPHONE

One of the army's finest built by Kellogg. Ideal for public address, transmitters, etc. Add postage for 5 lbs..... **$2.95**

POCKET TESTER KIT

$2.95 Build this AC and DC voltmeter and save 2/3 the cost. Includes 2½" meter, resistors, rectifier, and mounting. Reads 0 - 3 - 30 - 300 VDC and 0 - 300 VAC, instructions. Add postage for 2 lbs.

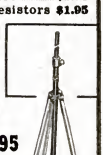
RADIO BUILDERS' KITS

Power supply kit to convert to army radios 110 VAC	$5.95
5" P.M. loudspeaker for army radios	$2.80
Experimenter's Kit, 5 lb. of radio parts for	$1.00
Kit of 20 radio tube sockets for	$1.00
Kit of 20 Bypass bathtub condensers	$1.00
Kit of 10 radio volume controls	$1.95
Kit of 10 Midget variable condensers	$1.95
Kit of 100 color coded insulated resistors	$1.95

G.E. CIRCUIT BREAKER

$2.95 Protect your electrical equipment, eliminate fuses. 50 AMP 220 Volt rating. Add postage for 4 lbs.

ARMY TRIPODS



Excellent for floodlights, screens, etc. Raises to 12 ft., folds to 5 ft. Rugged construction. Express shipment only **$4.95**

MINIATURE MOTOR

$2.95 24V.D.C. size 1¼"x1"x2". Add postage for 1 lb.

Power supply kit to convert motor to 110 V.A.C. Add postage for 6 lbs. **$2.49**

NO ORDERS under $2.00

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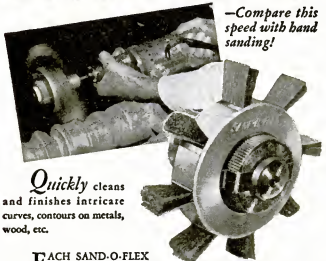
DEPT. M . . BENTON HARBOR, MICH.

14,000 sanding strokes per min. with SAND-O-FLEX

—Compare this speed with hand sanding!



Quickly cleans and finishes intricate curves, contours on metals, wood, etc.

EACH SAND-O-FLEX sanding wheel contains 8 abrasive strips backed up by 8 separate brushes. When rotated at usual motor speed, you get *14,000 sanding strokes per minute!*

Not only does SAND-O-FLEX finish faster—it gets in and around complicated forms. Brushes mold to the work shape and rapidly sand, de-burr, finish. Produces beautiful satin finishes on metal. Abrasive strips unreel when worn. Replacement cartridges in many grits available at low cost.

Use SAND-O-FLEX on your present tools—motor shaft, electric drill, flexible shaft, drill press, lathe, etc. SAND-O-FLEX has unlimited uses in home, farm and industrial workshops—5 sizes. See your dealer or write for free literature.

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PLAN YOUR GARDEN EARLY

And put Garden-All's rugged power to work for you!

Garden-All LAWN and GARDEN TRACTOR

STURDY VERSATILE EFFICIENT

With all attachments: **Plow, Disc, Spike Tooth Harrow, Cultipacker, Seeder, Cultivator, Sickle Bar, Utility Scraper and Dump Trailer.**

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Make your garden more productive! Grow more food with less effort by putting Garden-All to work for you. Garden-All is built to handle every garden chore. There's a tool for every job and you can attach or detach any tool in less than a minute. It's economical to operate too! See Garden-All before you buy any power garden equipment.

Excellent Dealer Territories Open. Write for Details.

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Dept. P, 100 W. UNION STREET, LIBERTY, INDIANA

once more gracing the boards of the Wheeler Opera House.

Again the center of social activity is the Hotel Jerome, but now smartly garbed skiers instead of heavy-booted miners crowd the lobbies. For those who want simpler accommodations, there are the Victoria, Floradora and Gibson Girl guest houses for individuals or small groups. Still lower priced are the Roaring Fork and Ski Barn dormitories, and space is being provided at the Prince Albert for those who bring bed rolls to sleep for 75 cents a night.

Within its "fence" of 40 of the tallest peaks in the Rockies, Aspen again lives a bustling existence. This time, natives and newcomers assure you, it's forever!

Sandfighters of the Columbia

(Continued from page 110)

head in much the same manner as its bigger sisters. Its main advantage is that it can be transported by truck. It has become extremely valuable for clearing sand from the widely separated locks and canals that by-pass the worst of the rapids.

Two bucket dredges are also used on the river, the Monticello and the No. 501. Similar in operation to construction cranes, they work in small, congested areas.

But at the mouth of the river an entirely different kind of dredge is needed. Here is the delta of the Columbia, a tremendous deposit of sand through which test drills have been lowered a thousand feet without finding any other material. And the creeping sandspits there have wrecked hundreds of ships—Peacock Spit is dreaded by mariners of many nations.

Hydraulics cannot operate at the mouth of the river. Their pipe lines are too vulnerable to the buffeting of storms. Bucket dredges cannot work in the heavy Pacific rollers. So a different type, sea-going hopper dredges, are fighting the sandspits. These are a form of hydraulic dredge but also are full-rigged 250-foot ships. With accommodations for 10 officers and 44 men, they draw up 1278 cubic yards of sand through suction pipes set amidships and carry the sand in hoppers in their holds. Then they steam over the bar to dump their loads in the depths of the Pacific.

The river sometimes wins. Peacock Spit constantly is thrusting out new shallows to catch a ship. And the immensity of sand in the length of the Columbia makes all the dredges seem puny in comparison. But the sand-eating fleet fights on, cleaning out the channels and building levees out of the river's own weapon.

OIL-PUMPING in your car warns that you need new piston rings. It's the *first* sign of worn-out rings and the danger signal of undue engine wear.

Fortunately, rings are *replacement* parts. And when you replace with Hastings Steel-Vent piston rings, you *stop* oil-pumping, *check* cylinder wear and *restore* performance. It's the best money you can spend on your car.

HASTINGS MANUFACTURING COMPANY
HASTINGS, MICHIGAN
HASTINGS LTD., TORONTO

HASTINGS

STEEL-VENT PISTON RINGS

TOUGH *on Oil Pumping*
GENTLE *on Cylinder Walls*

Emergency Bottled Power!

New DOUBLE-PURPOSE **AIR-O-FLATER**

FIRE EXTINGUISHER
TIRE INFLATER

New LOW PRICE $5.45
Complete with mounting bracket

Distributors WANTED

A "MUST" FOR CAR OWNERS!

Puts out gas, oil and electrical fires—contains the new CO2 fire-fighting gas, under high pressure. Safe and easy to operate, non-injurious and quick-acting. Also inflates tires "in a jiffy"—simply attach hose connection to valve stem and turn lever of AIR-O-FLATER—tire is inflated in about 3 seconds.

See your dealer, or mail check (or M.O.) for $5.45—satisfaction guaranteed or money refunded. Refill—75c.

GENERAL AIR PRODUCTS CORP.
3318 MONTROSE AVE. • CHICAGO 18, ILL.

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AT A FRACTION OF ORIGINAL COST

HYDRAULIC PUMP
No 1—New, gear type hydraulic pump; 1000 p.s.i., pulley drive, (Pulley not included). Ideal for hydraulic rams, struts, concrete machine (blocks) or any place power is needed. Built by Pesco. Readily converted for use as sump pump. Shp. wt. 5 lbs. Each $9.95

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No. 2—Ideal for use on boats, trucks, light and power plants, light welders, water wheels, etc. 24 volts, 25 amps, RPM 2500, ⅝ inch diam. shaft. Measures 10x5 in. diam. Actual weight 23½ lbs. Guaranteed brand new. Shp. wt. 28 lbs. Two for $30.00. Each $17.50

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Has high insulating factor. Use it for covering "live" wires and improved appearance to any wiring job. In red, white or transparent. Inside diam. .160 or approx ¼ inch. Brand new! 100 ft. length. Only $2.25

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No. 6—Type RL-7. Contains tubes, coils, condensers, plugs, fuse holders, switches, 24 volt dynamotor with 250 volt output. Used but good. Wgt. 9 lbs. Each $5.95

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No. 7—A full 10 lb. asst. of popular size screws, rivets, bolts, washers, etc. Loose and mixed but all new and perfect. Fine for home and shop. Shp. wgt 12 lbs. Complete only $1.95

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No. 7—Throat type microphone. Three for $2.00. Each only 95c

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No. 5—Over 600 metal, rubber bonded clamps: six sizes up to 1⅜ inch. Shp. wgt. 12 lbs. Only $6.50

No. 5A—As above but 1½ assort. Wgt. 8 lbs., $3.95 only

All F.O.B. Houston. Mail orders promptly filled. Send check or money order. Satisfaction guaranteed.

AERO INSTRUMENT COMPANY, Dept. PM 1
MUNICIPAL AIRPORT HOUSTON, TEXAS

POLISHES! SANDS! GRINDS!
CURVED & FLAT SURFACES — FASTER — EASIER! Works with any ½" Electric Power Drill, Flexible Shaft.

You Can Use It To: Fix Bodies, Fenders; Wax, Polish Cars, Floors, Linoleum; Refinish Furniture, Wood, Metal Surfaces; Smooth, Reduce Welds; etc.

NEW FLEX Sander-Polisher

Works with your electric drill, flexible shaft or chuck equipped motor. Speeds up all grinding, sanding and polishing jobs—fits any ¼ inch chuck. Rubber face plate flexes into curves for fast, smooth, clean work. Outfit includes 6½ inch rubber disc, with metal flange and shank, fibre backed sanding disc, and heavy sheep's wool polisher. Makes your drill the equal of any $75.00 grinding or polishing outfit. Satisfaction guaranteed. Order today. F.O.B. Chicago. Only $4.95

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New! BLACK & DECKER

HOME-UTILITY
¼ inch
ELECTRIC DRILL

This portable electric drill handles hundreds of "odd jobs" in homes, hobby shops, farms, repair kits. Only 7⅝" long, weighs 3¼ lbs. Will drill to ½" in steel. Has fast-operating Jacobs hex-key chuck and an instant-release trigger switch. Operates from any 110 volt A.C. or D.C. circuit at 2250 RPMs. Order today for immediate delivery. $18.95

Postpaid upon receipt of check or M.O.; C.O.D. you pay postage.
For General "all-purpose" drilling from ⅛" to ½" order the Black & Decker Home-Utility ¼ inch Electric Drill $39.95

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STATION WAGON BODIES
AND CABS FOR ALL CARS, JEEPS
SMART MAPLE—OAK WOODS

Year around comfort for Jeep owners. Kiln dried hardwoods, safety glass. Finest hardware, varnishes, top materials. Full overnight door locks. Send 25c with order balance COD. $165 FOB Cleveland, plus tax, complete, semi-assembled.

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OTHER CABS converted to station wagons. Write for details.

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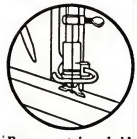
only $47.50 TESS MOTOR

for this popular
"QUAD-CITY SHARPENER"

Get into profitable lawn mower sharpening at low cost with this highly successful machine. Order direct from
QUAD-CITY PRODUCTS CO., Box 42, Rock Island, Ill.

Blade guide aids close following of a line or pattern.

Steel universal chuck holds all blades, files, and sanding attachments.



Because spring hold-down tilts with table to hold work firmly, you enjoy smooth operation always.

V-jaws of universal chuck hold files with 1/8" or 1/4" shanks.

Using sanding attachment, you finish exterior and interior surfaces easily.

HM-54

Furnished with 4-inch pulley, pulley guard, removable table insert, 3 saw blades, blade guard, dust blower tube, 2 wrenches.

Saws wood up to 2 inches thick — cuts light metals, and plastics. Cuts to center of 32-inch panel.

New! HOMECRAFT® 16" SCROLL SAW built expressly for the hobbyist

Only $29.95 (Less lamp attachment and motor)

It's now available at your dealer's store, at surprisingly low cost — this good-looking *Homecraft* 16" Scroll Saw.

With its speed of 1275 cutting strokes per minute, you can do fast, accurate scroll-sawing of all types: fret work, inlay work and marquetry, jig saw puzzles, etc.

Made by a Leading Tool Builder!

Behind the *Homecraft* 16" Scroll Saw is the engineering skill of the men who make Delta Power Tools. In schools and factories, as well as home shops, Delta tools have long been recognized as outstanding for safety, accuracy, and dependability.

Having a home shop equipped with Delta Power Tools some day is the dream of practically every craftsman who wants the very best!

Worthwhile Features!

With the *Homecraft* 16" Scroll Saw, Delta answers the demand for a good, popular-priced tool that is adequate for the average limited needs of the hobbyist who "putters around" with woodworking.

Delta engineers have included features that make it a real value for the money — a tool you've every right to be proud to own:

Bearings are constantly lubricated from the splash system in the crankcase. . . . Universal blade chuck fits all types of blades, files, and sanding attachments. . . . Pump in head supplies continuous air flow, to keep cutting line free from sawdust. . . . 11" x 11" table tilts 45 degrees to the right and 15 degrees to the left, for angle-cutting. . . . Guides are fully adjustable. . . . Upper and lower chucks rotate 90 degrees, for unlimited-length side cuts. . . . Accurately-machined one-piece casting forms base and arm. . . . Pulley guard provides safety.

See It At Your Dealer!

Ask your *Homecraft* dealer to show this scroll saw, and his complete display of *Homecraft* Power Tools that range in price from $29.95 to $39.95.

Visit your Homecraft dealer now!

Catalog Sheets!— Show all Homecraft Power Tools and accessories. Sent to you free. Use coupon, for your copies.

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Tear out coupon and mail today!

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Please send free catalog sheets on Homecraft Power Tools.

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The "Coax" Has Nerves

(Continued from page 85)

which is being built at the present time.

To date the Bell System has installed more than 4000 miles of coaxial cable in the United States and has accelerated its program of laying more cable along the busiest routes. By the end of 1949 approximately 11,000 miles of coaxial cable are expected to be installed, linking virtually all the large cities of the East, Middle West and Pacific Coast.

Meanwhile, technicians are experimenting with radio-relay systems for long-distance phone circuits, and radio routes are being extended. A radio link between New York and Boston is almost ready for use and a branch to Providence is under construction. A long-haul radio-relay system connecting New York and Chicago, with service to cities along the route, is planned for use in 1949.

Radio holds the promise of providing phone service to subscribers who live great distances from existing facilities. Subscribers who live in the Death Valley region, for example, now are connected with the outside world by a 27-mile radio link between Death Valley Junction and Specter Mountain. Rural radio service is being tested in eastern Colorado by circuits to eight ranches located 11 to 21 miles from an exchange. The radio sets are installed in the ranch houses, eliminating the need for stringing wires to each ranch.

Remote Control for Hot-Water Heater

Tiresome trips to the basement to turn on gas-fired, sidearm water heaters are eliminated by a remote-control switch installed on the first or second floor of a home. The switch can be set for automatic operation to maintain a constant supply of water, or it can be turned on and off to provide hot water when needed. The pilot is a thermocouple type which generates its own power to operate the valve.

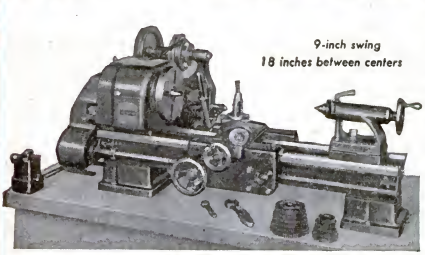
Frozen Sandwiches Ease Lunch Problem

Putting up lunches for Junior and Dad doesn't have to be a daily chore for Mother. By freezing the sandwiches, she can use mass-production methods to turn out several weeks' supply at one time. Dr. Faith Fenton of Cornell University has discovered that the lunches will thaw at room temperature in about three hours and when eaten, will taste like sandwiches made fresh that morning. Fillings suitable for freezing include cheddar and cream cheese, sliced and ground meat, poultry, fish and cooked egg yolk.

A NAME TO REMEMBER WHEN YOU THINK OF BETTER LATHES AND SHAPERS

Logan

SPEED, ACCURACY AND RUGGEDNESS



9-inch swing
18 inches between centers

Make This 9-Inch Logan Lathe a Stand-Out at $159.50

- Here in compact, 9-inch size are the speed, accuracy and precise, rugged construction that make the larger Logan Lathes outstanding industrial performers. High speed, ball bearing spindle stays accurate. Self lubricating bronze bearings protect vital points. Bed ways precision ground to within .0005" of parallelism. See it at your Logan Lathe dealer's, or write for information.

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25 RODS **SAMPLER KIT** 25 SIZES

Ground and Polished to a Perfect Finish

1001 Uses for Craftsmen, Hobbyists, Mechanics, etc.

For Making Punches, Chisels Engraving Tool Shafts, Etc.

Free machining, easily worked, yet can be made file hard or hardened to spring temper. Hardening instructions included

FREE
With Every Kit or first order 6" Steel comb. rule and depth gage with pocket clip and latest price list.

FLAT TOOL STEEL

The Precision ground flat tool steel with the satin-smooth finish. Simple to work, easy to harden, ready to use.

SHOP ASSORTMENT $4.80
5 dif. Pieces—1/32" to 1/8" thick 1/2" wide; 18" long.

BOTH KITS — $6.50

Complete ALUMINUM—BRASS—STAINLESS and TOOL STEEL Stocks include 25c postage on orders under $5.00.

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TOOLS SURPLUS BARGAINS

One of the largest stocks of tools, and other items such as motors, compressors, equipment, etc.

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1/4" — $6.50, 3/8" — $7.95, 1/16" — $1.95, 1/2" — $2.95

BALL PEIN HAMMERS
2 oz — $1.29, 11/2 oz — $1.00, 1 oz — 89c, 8 oz. — 89c

10" ERWIN SCREW DRIVER—79c

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All bronze, new. List price $5.25 . . . sale price, ea., $3.49

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18"—$3.49, 24"—$4.49

New CENTURY ELECTRIC DRILLS—1/4" complete with 14 drill bits up to 1/4" in steel box, only $25.50

EAGLE DRILL same as above $19.50
Prices F.O.B. K. C. Order Now—Immed. Shipment

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ONLY $2.00 P.P.

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EASILY INSTALLED—complete instruction sheet with each lite.
FITS ANY CAR OR TRUCK.
Order now from your dealer. If he cannot supply you, send us $2.00 (M.O. pref.) and we will ship promptly postpaid in U.S.A.

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GUARANTEED
CALENDAR
WATCH

Tells time, name of day and date. Day name changes automatically.

No. MP 383 — 17 jewels, water-shock resistant, anti-magnetic, radium dial and hands. ALL STAINLESS STEEL CASE..... $55.00

OTHER SPORT WATCHES WATER-SHOCK RESISTANT

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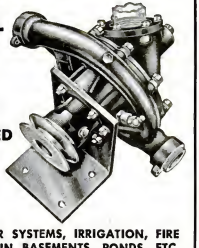

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● A super value for all types of intermittent service in pumping large volumes of liquid for stock watering, home and shop water systems, irrigation, draining pools, basements, etc. At 1750 RPM on 23 foot head will pump 42 gallons per minute; at 3600 RPM on 52 foot head will move 88 gallons per minute. Cast aluminum housing. Accurately machined bronze impeller vanes. Complete with mounting bracket and 2½ inch V belt pulley. Run with electric motor, gasoline engine, power take-off on tractor, etc. Shaft rotates on sealed ball bearings with grease cup. Size 12 x 12 x 12 inches. Weighs approx. 35 pounds. Extra value for both as necessary. Made for Packard Motor Car Co. for use in Rolls-Royce Merlin Aircraft engines. Comes complete with pulley and mounting bracket. Original cost approx. $147.00. Sold F.O.B. Chicago. Shipping weight 25 pounds. Complete engineering reports and operating instructions free with pump. You can't beat this pump value at anywhere near this price. Satisfaction guaranteed.

ORIGINAL COST APPROX. $147.00
IMMEDIATE DELIVERY FOB CHICAGO
SPECIAL PRICE, WHILE THEY LAST $29.75

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Sharpening Lawn Mowers

BUILD A BUSINESS OF YOUR OWN WITH A UNIVERSAL GRINDER

In your basement or garage. Earn $150 a month. Mr. Felber of Ind. writes, "My UNIVERSAL GRINDER is faster and more accurate than any other grinder. Its efficiency enabled me to sharpen 450 mowers in 4½ months. More than paid for itself the first month. Every customer satisfied." Mr. Hardy of Mississippi writes, "Received my Universal Grinder the first part of May and by August 18 had sharpened over 1000 mowers." Mr. Bacon of California writes, "The lawn mower business, with my Universal Grinder, has been a gold mine these last two years."

Only on the UNIVERSAL GRINDER can the inside face and edge of the stationary blade, as well as the real blades, be ground to proper clearance

ALL IN ONE SET UP
without removing any blade from the mower.
Tool grinding rest included.

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Hundreds of factories are saving time and protecting workers with Steel-Grip Finger Guards. Used for handling rough, sharp articles, buffing, grinding, sanding, polishing, punch press work, many other jobs. Wear on fingers or thumb, front or back. Durable leather, elastic web back for snug, cool, comfortable fit. Easy on and off. One size fits all, men or women. Send 10c each for samples or trial order box of 50 at $4.25 less 10%.

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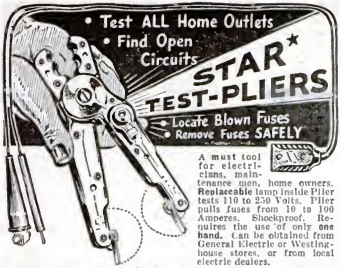

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Price $2.75 without Leads, $1.50 additional for Leads. Order TODAY.

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60 LBS. OF READY MADE PARTS Only $19.95

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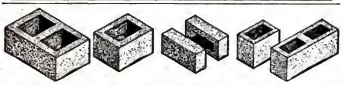

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Be Your Own Boss!

Right now—cash in on the building boom with an American Floor Sander! Hundreds of men have found they can make $35 to $50 a day in floor surfacing work with an American. Prospects everywhere! Sand new and old floors. American Sanders are easy to operate—no big overhead—no special schooling—and you are your own boss! Send for "money-making" booklet entitled "Opportunities in Floor Surfacing"—use coupon and enclose 25c in coin or stamps to cover handling.

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No C.O.D.'s. Postage prepaid.

Here is a complete Beam Compass and Measuring Device, all in one. Strong, compact, accurate, direct-reading. Has genuine 72" Lufkin Steel Rule Nickel Plated.

For architects, draftsmen, carpenters, woodworkers, sheet metal men, stone cutters, millwrights, pattern makers.

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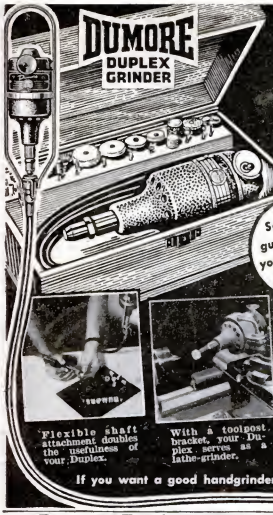

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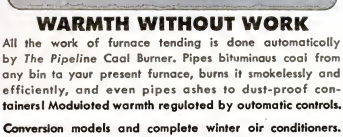

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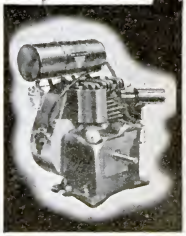

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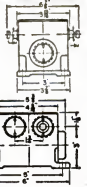

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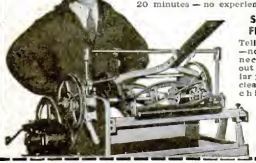

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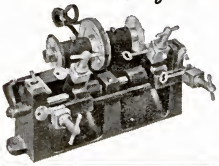

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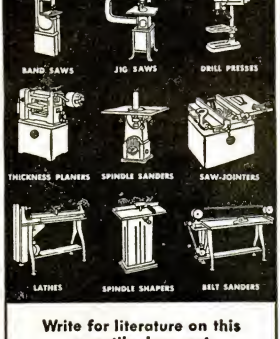

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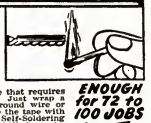

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